















Digitized by the Internet Archive  
in 2024









Color picture of a necrotic degeneration of a myoma of the uterus made at the operating table. These degenerations vary from a peculiar slate color to a dark reddish gangrenous appearance, depending upon the degree of interference with the surrounding circulation. In such cases the symptomatic anemia verges into a cachexia, and there is often an asthenia out of proportion to the uterine hemorrhage. Such cases should always be operated upon as the danger is increased by the further effects of the irradiation.

# INTERNATIONAL CLINICS

## A QUARTERLY

OF

ILLUSTRATED CLINICAL LECTURES AND  
ESPECIALLY PREPARED ORIGINAL ARTICLES

ON

TREATMENT, MEDICINE, SURGERY, NEUROLOGY, PÆDIAT-  
RICS, OBSTETRICS, GYNÆCOLOGY, ORTHOPÆDICS,  
PATHOLOGY, DERMATOLOGY, OPHTHALMOLOGY,  
OTOLOGY, RHINOLOGY, LARYNGOLOGY,  
HYGIENE, AND OTHER TOPICS OF INTEREST  
TO STUDENTS AND PRACTITIONERS

BY LEADING MEMBERS OF THE MEDICAL PROFESSION  
THROUGHOUT THE WORLD

EDITED BY

HENRY W. CATTELL, A.M., M.D., PHILADELPHIA, U.S.A.

WITH THE COLLABORATION OF

CHAS. H. MAYO, M.D.

ROCHESTER

SIR JOHN ROSE BRADFORD, M.D.

LONDON

HUGH S. CUMMING, M.D., D.P.H.

WASHINGTON, D. C.

WILLIAM S. THAYER, M.D.

BALTIMORE

JOHN G. CLARK, M.D.

PHILADELPHIA

FRANK BILLINGS, M.D.

CHICAGO

JAMES J. WALSH, M.D.

NEW YORK

A. McPHEDRAN, M.D.

TORONTO

CHARLES GREENE CUMSTON, M.D.

GENEVA

SIR HUMPHRY ROLLESTON, K.C.B., M.D., D.C.L.

LONDON

JOHN FOOTE, M.D.

WASHINGTON, D. C.

SEALE HARRIS, M.D. CHARLES D. LOCKWOOD, M.D. A. H. GORDON, M.D.

BIRMINGHAM, ALABAMA

PASADENA, CALIFORNIA

MONTREAL

CORRESPONDENTS

JAMES BURNET, M.D.

EDINBURGH

THOMAS LINN, M.D.

NICE, FRANCE

---

VOLUME I. THIRTY-FOURTH SERIES, 1924

---

PHILADELPHIA AND LONDON

J. B. LIPPINCOTT COMPANY

1924



COPYRIGHT, 1924

BY

J. B. LIPPINCOTT COMPANY

PRINTED BY J. B. LIPPINCOTT COMPANY  
AT THE WASHINGTON SQUARE PRESS  
PHILADELPHIA, U. S. A.



# CONTRIBUTORS TO VOLUME I

## (THIRTY-FOURTH SERIES)

	PAGE
BARKER, LEWELLYS F., M.D., LL.D., Professor Emeritus of Medicine in Johns Hopkins University; Visiting Physician to Johns Hopkins Hospital, Baltimore .....	1
BRILL, NATHAN E., M.D., Attending Physician, First Medical Division, Mount Sinai Hospital; Professor of Clinical Medicine, College of Physicians and Surgeons (Columbia University), New York City.....	32
CATTELL, HENRY W., A.M., M.D., Sometime Pathologist to the Philadelphia General Hospital, the Presbyterian Hospital and the Pennsylvania Hospital, Philadelphia .....	227
CLARK, JOHN G., M.D., William Goodell Professor of Gynæcology, University of Pennsylvania, Philadelphia .....	74
COGNÉ, RENÉ, M.D., Paris, France.....	99
DRUECK, CHARLES J., M.D., Professor of Diseases of the Rectum and Colon, Post-graduate Hospital and Medical School, Chicago.....	145
EICHENLAUB, F. J., M.D., Associate Professor of Dermatology, Georgetown University; Associate Professor of Dermatology, Howard University, Washington, D.C. ....	68
ELLIOTT, BLANCHE, M.D., Interne in the Philadelphia General Hospital, Philadelphia .....	132
FOOTE, JOHN A., M.D., Professor of Pædiatrics, Georgetown University; Visiting Pædiatrist, Children's Hospital, Washington, D.C. ....	61
GORDON, A. H., M.D., Assistant Professor of Medicine, McGill University; Physician to the Montreal General Hospital, Montreal, Canada.....	120
GRIFFITH, J. P. CROZER, M.D., Professor of Pædiatrics, University of Pennsylvania, Philadelphia .....	17
HITCHENS, A. PARKER, M.D., Major in the Medical Corps, U. S. Army, Washington, D.C. ....	227
LYDD, JAMES HENDRIE, M.D., Neurologist to the Philadelphia General Hospital, Philadelphia .....	132
MAGNAC, J. L., M.D., Ex-interne of the Versailles Hospital, Versailles, France	106
MOSER, JAMES M., M.D., Clinical Professor of Pædiatrics, Georgetown University; Director of Out-patient Clinic, Children's Hospital, Washington, D.C. ....	54
O'DONNELL, WILLIAM F., M.D., Clinical Professor of Pædiatrics, Georgetown University; Pædiatrist to the Providence Hospital, Washington, D.C. ...	48

PENNINGTON, J. RAWSON, M.D., F.A.C.S., Surgeon to Columbus Hospital and U. S. Veterans' Hospital No 30, Chicago.....	138
PRICE, GEORGE M., M.D., Director, Union Health Centre, New York City.....	182
RECTOR, FRANK L., B.S., M.D., Secretary, Conference Board of Physicians in Industry, New York City.....	159
SWEET, J. E., A.M., M.D., Sc.D., Professor of Surgical Research, University of Pennsylvania, Philadelphia .....	187
WEBER, F. PARKES, M.A., M.D., F.R.C.P., Senior Physician, German Hospital, London, England .....	88
WILLSON, PRENTISS, M.D., Associate Professor of Obstetrics, Georgetown University, School of Medicine, Washington, D.C. ....	41

# CONTENTS OF VOLUME I

(THIRTY-FOURTH SERIES)

	PAGE
CLINICAL LECTURES	
EXOPHTHALMIC GOITRE. By LEWELLYS F. BARKER, M.D., LL.D., Professor Emeritus of Medicine in Johns Hopkins University; Visiting Physician to Johns Hopkins Hospital, Baltimore.....	1
HEART DISEASE IN CHILDREN—INFANTILE CEREBRAL PARAL- YSIS. By J. P. CROZER GRIFFITH, M.D., Professor of Pædiatrics, Univer- sity of Pennsylvania, Philadelphia.....	17
ESSENTIAL HEMORRHAGIC PURPURA. By NATHAN E. BRILL, M.D., Attending Physician, First Medical Division, Mount Sinai Hospital; Professor of Clinical Medicine, College of Physicians and Surgeons (Columbia University), New York City.....	32

## SYMPOSIUM ON THE NEW-BORN

THE PROBLEMS OF PRENATAL, NATAL AND NEONATAL MOR- TALITY. By PRENTISS WILLSON, M.D., Associate Professor of Obstet- rics, Georgetown University, School of Medicine, Washington, D.C. ....	41
INJURIES AND ACCIDENTS IN THE NEWLY BORN. By WILLIAM F. O'DONNELL, M.D., Clinical Professor of Pædiatrics, Georgetown Univer- sity; Pædiatrist to Providence Hospital, Washington, D.C. ....	48
CARE OF THE NEW-BORN CHILD. By JAMES M. MOSER, M.D., Clinical Professor of Pædiatrics, Georgetown University; Director of Out-patient Clinic, Children's Hospital, Washington, D.C. ....	54
GENERAL DISEASES OCCURRING IN THE NEWLY BORN. By JOHN A. FOOTE, M.D., Professor of Pædiatrics, Georgetown University; Visiting Pædiatrist, Children's Hospital, Washington, D.C. ....	61
SKIN AFFECTIONS OF THE NEW-BORN BABY. By F. J. EICHENLAUB, M.D., Associate Professor of Dermatology, Georgetown University; Associate Professor of Dermatology, Howard University, Washington, D.C.	68

## DIAGNOSIS AND TREATMENT

THE SURGICAL AND IRRADIATION TREATMENT OF BENIGN AND MALIGNANT GROWTHS OF THE UTERUS. By JOHN G. CLARK, M.D., William Goodell Professor of Gynæcology, University of Pennsyl- vania, Philadelphia .....	74
--	----



HEPATIC CIRRHOSIS AND THE QUESTION OF THE OPERATIVE TREATMENT OF CHRONIC ASCITES. By F. PARKES WEBER, M.A., M.D., F.R.C.P., Senior Physician, German Hospital, London, England...	88
THE USE OF CONVALESCENT SERUM IN A CASE OF CONGENITAL MEASLES. By RENÉ COGNÉ, M.D., Paris, France.....	99
SURGICAL TUBERCULOSIS OF THE SPLEEN. By J. L. MAGNAC, M.D., Ex-interne of the Versailles Hospital, Versailles, France.....	106
SOME ASPECTS OF MIGRAINE. By A. H. GORDON, M.D., Assistant Professor of Medicine, McGill University; Physician to the Montreal General Hospital, Montreal, Canada.....	120
A CASE OF HERPES ZOSTER IN THE DISTRIBUTION OF THE INFERIOR MAXILLARY NERVE ASSOCIATED WITH PARALYSIS OF THE FACIAL NERVE. By JAMES HENDRIE LLOYD, M.D., Neurologist to the Philadelphia General Hospital, Philadelphia, and BLANCHE ELLIOTT, M.D., Interne in the Philadelphia General Hospital, Philadelphia	132

### RECTAL DISEASES

THE TREATMENT OF ANAL, ANORECTAL AND RECTAL FISTULÆ. By J. RAWSON PENNINGTON, M.D., F.A.C.S., Surgeon to Columbus Hospital and U. S. Veterans' Hospital No. 30, Chicago.....	138
EXAMINATION OF THE FÆCES. By CHARLES J. DRUECK, M.D., Professor of Diseases of the Rectum and Colon, Post-graduate Hospital and Medical School, Chicago .....	145

### INDUSTRIAL MEDICINE

MEDICAL ASPECTS OF WORKMEN'S COMPENSATION LAWS. By FRANK L. RECTOR, B.S., M.D., Secretary, Conference Board of Physicians in Industry, New York.....	159
INDUSTRIAL HEALTH SUPERVISION. By GEORGE M. PRICE, M.D., Director, Union Health Centre, New York City.....	182

### MÜTTER LECTURE OF THE COLLEGE OF PHYSICIANS OF PHILADELPHIA

THE GALL-BLADDER: ITS PAST, PRESENT AND FUTURE. By J. E. SWEET, A.M., M.D., Sc.D., Professor of Surgical Research, University of Pennsylvania, Philadelphia .....	187
---	-----

### PROGRESS OF MEDICINE FOR 1923

By HENRY W. CATTELL, A.M., M.D., Sometime Pathologist to the Philadelphia General Hospital, the Presbyterian Hospital and the Pennsylvania Hospital, Philadelphia, and A. PARKER HITCHENS, M.D., Major in the Medical Corps, U. S. Army, Washington, D.C. ....	227
--	-----

# LIST OF ILLUSTRATIONS TO VOLUME I

## (THIRTY-FOURTH SERIES)

### COLORED PLATE

PAGE

Necrotic degeneration of a myoma of the uterus. (Color sketch made at the time of the operation) .....	<i>Frontispiece</i>
--	---------------------

### PLATES, FIGURES AND CHARTS

Patient with exophthalmic goitre, after thyroidectomy (Fig. 1) .....	4
Von Graefe's sign or lagging of the upper eyelid and exposure of the white of the sclera between the cornea and the upper lid as the eyes are moved downward (Fig. 2) .....	5
Joffroy's sign in exophthalmic goitre in which no wrinkling of the forehead is seen upon the eyes moving markedly upward: To be compared with normal case shown in Fig. 4 (Fig. 3) .....	4
Normal movements of forehead upon the eyes being turned upward (Fig. 4) .....	5
Practical method of showing weakness of the quadriceps muscles in exophthalmic goitre: Normal person raising himself up from the ground on to a chair (Figs. 5, 6 and 7) .....	6
A persisting facial palsy (Fig. 1) .....	50
Malnutrition and atrophy in twins through lack of breast milk and improper feeding (Fig. 1) .....	56
Temperature and weight charts in pneumonia of the new-born and in inanition fever (Chart 1) .....	62
Chart showing intraperitoneal injection of human blood in spontaneous hemorrhage (Chart 2) .....	65
Ichthyosis ("harlequin foetus") (Fig. 1) .....	68
Impetigo contagiosa (Fig. 2) .....	72
Bullous impetigo (Fig. 3) .....	72
Linear naevus verrucosus (Fig. 4) .....	73
Linear naevus which was present at birth (Fig. 5) .....	73
Condyloma in congenital syphilis (Fig. 6) .....	72
Congenital annular syphilis (Fig. 7) .....	72
Condylomata (Fig. 8) .....	73
Congenital syphilis around the mouth (Fig. 9) .....	73
Diagrammatic sketch of making the Keene suture through the skin, fat, rectus fascia, etc. (Fig. 1) .....	76
Keene sutures in place ready to tie over gauze bolsters and tension sutures already tied over the bolsters (Fig. 2) .....	77
Method of securing the round ligaments in the cervical stump or vaginal cuff in either a supravaginal hysterectomy or a pan-hysterectomy, thus giving stability to the pelvic tissues and the supporting upper part of the vagina (Fig. 3) .....	78
The peritoneal suture completed (Fig. 4) .....	79

Clark method of circumcising the cervix with a knife and then amputating with the cautery to avoid the danger of carrying infection or cancerous tissues into the parametrium (Fig. 5) .....	78
Temperature chart in case of congenital measles (Chart 1) .....	103
Semi-diagrammatic sketch of face showing distribution of nerves thereto (Fig. 1) .....	134
Herpes of the face (Fig. 2) .....	136
Herpes of the face, with paralysis of the left facial nerve (Fig. 3) .....	136
Diagram of rectal, anal and anorectal fistulæ (Fig. 1) .....	139
Method of operating in rectal fistulæ (Fig. 2) .....	140
Seton method of treating anorectal fistulæ (Fig. 3) .....	142
Situation of the gall-bladder in human embryo of between three and four weeks (longitudinal section) (Fig. 1) .....	189
Reconstruction model of a chick embryo: <i>A</i> , third day; <i>B</i> , fourth day (Fig. 2) .....	190
Reconstruction model of a rabbit embryo, showing liver and gall-bladder and adjacent structures (Fig. 3) .....	190
Further stage of development of rabbit from Figs. 2 and 3 (Fig. 4) .....	191
Location of the gall-bladder of the boa constrictor (Fig. 5) .....	193
Schemata of the hepatic and cystic ducts and gall-bladder in birds (Fig. 6) .....	194
Abnormalities of the bile-ducts (Fig. 7) .....	195
Abnormalities of the bile-ducts (Fig. 8) .....	196
The normal gall-bladder (Fig. 9) .....	197
The gall-bladder in its normal position, the liver being turned upward (Fig. 10) .....	198
The cystic kink (Fig. 11) .....	199
The valve of Heister (Fig. 12) .....	200
The valve of Heister (Fig. 13) .....	201
Longitudinal section of the cystic duct of dog, showing the musculature of a heisterian valve (Fig. 14) .....	202
One of the longitudinal serial sections of the cystic duct of man, showing the musculature of a valve of Heister (Fig. 15) .....	202
Longitudinal section of the gall-bladder of man. x30 (Fig. 16) .....	203
The musculature of the gall-bladder. x4 (Fig. 17) .....	203
The musculature of the distended gall-bladder (Fig. 18) .....	203
Cross-section of a fold of the gall-bladder (Fig. 19) .....	204
The folds of the gall-bladder mucosa (Fig. 20) .....	204
The blood-vessels of the gall-bladder (Fig. 21) .....	205
The lymphatics of the gall-bladder (Fig. 22) .....	206
Reconstruction of the wall of the gall-bladder (Fig. 23) .....	206
Section of the human adult gall-bladder (Fig. 24) .....	207
Cross-section of the bile-ducts (Fig. 25) .....	208
The "scrobes depressæ" of Haller (Fig. 26) .....	208
The "vasa aberrantia" of the bile-ducts (Fig. 27) .....	209
The "vasa aberrantia" of the dog (Fig. 28) .....	209
Anastomoses of the bile-ducts as seen by a magnification of 18 diameters (Fig. 29) .....	210
Cross-section of bile-duct (Fig. 30) .....	210



Coccidiosis, rabbit liver (Fig. 31) .....	210
Dicrocoelium dendriticum, sheep liver (Fig. 32) .....	210
The parietal sacculi of the pig (Fig. 33) .....	211
One of the sacculi of the pig (Fig. 34) .....	211
The parietal sacculi of the horse ( <i>A</i> ); pig ( <i>B</i> ); cat ( <i>C</i> ) (Fig. 35) .....	211
Extract from Heister's concept of gall-bladder function (Fig. 36) .....	212
Schematic outline of the function of the pancreas and liver (Fig. 37) .....	213
The cholesterol of the blood of the normal and the cholecystectomized dog (Fig. 38) .....	216
The blood cholesterol: Composite of four normal and three cholecystecto- mized dogs (Fig. 39) .....	218
The lecithin of the blood of the normal and the cholecystectomized dog (Fig. 40) .....	220
The cholesterol partition curves (Fig. 41) .....	221
The parietal sacculi of the normal dog (Fig. 42) .....	223
The parietal sacculi of the cholecystectomized dog (Fig. 43) .....	223
Schematic outline of normal sacculi ( <i>A</i> ), and the same after cholecystec- tomy (Fig. 44) .....	224
Drawings from photographs of two normal extrahepatic bile-ducts of the dog ( <i>A</i> and <i>B</i> ), with the bile-ducts of a cholecystectomized dog ( <i>C</i> ) (Fig. 45) .....	224



# Clinical Lectures

---

## EXOPHTHALMIC GOITRE \*

By LEWELLYS F. BARKER, M.D.

Baltimore, Maryland

---

THERE was such a gratifying response on the part of practitioners to the medical clinics held last year that I am very glad that the Committee on Medical Extension Work has decided to continue them this session. Doctor Pincoffs has invited me to give four or five of these clinics during the next several months, and they will be reported in the pages of the INTERNATIONAL CLINICS.

I feel that it is the duty of those interested in medical education to keep in mind the "forgotten man" in practice as well as the student in the medical school. We have had so taxing an enterprise on our hands in the organization of under-graduate medical instruction that some of us have seemed to forget that there are a hundred thousand doctors responsible for the medical care of a hundred million citizens, and that these practitioners deserve at least some attention from medical educators. The experiences during the World War, when doctors were brought from all over the country into the army to take care of the soldiers, were startlingly indicative of a great need of graduate instruction in medicine. I think that many medical educators became awakened at that time, if they had not been awakened before, to the insufficient provision made for keeping the men in the rank and file of practice in touch with advances in medicine.

One must have great sympathy with the general practitioner who desires to keep pace with the progress of medicine. He may become so busy in practice, his time may be so occupied, that he finds it difficult to do so. He tries to read, and he attends a number of medical societies, but these measures of self-improvement are not

---

\* A clinical lecture delivered November 8, 1923, in the Medical Extension Course, University of Maryland. Revised from stenographic notes taken by Miss Mary E. Reik.

sufficient. He needs in addition to have the new facts summarized and brought to him in simple form. Moreover, the facts should be carefully sifted for him. There is so much appearing in medical literature that no one man can find time to read it all; those who are supposed to be expert in special domains ought from time to time to bring together what is important for practice in the new knowledge and to present it concisely and entertainingly to practitioners so that they can grasp it quickly and make use of it in the diagnosis and treatment of their patients.

It seems to me that the case chosen for the clinic to-day illustrates very well a topic of interest to all practitioners. You see before you a man with protruding eyeballs, wide lid-slits, an anxious face and a full neck (Fig. 1) and you have doubtless guessed correctly that we have to deal with a case of exophthalmic goitre, or so-called Graves's syndrome, and there is, as you know, no subject in contemporary medicine perhaps that is more under discussion than Graves's disease. We have, in recent years, learned much, it is true, about the diagnosis and treatment of exophthalmic goitre, but even yet the pathogenesis of the disease is very obscure, and there are still wide differences of opinion as to the best way to treat the patients who suffer from it. The question is still asked, "What shall we do in order best to help them? Shall we apply surgical treatment or medical treatment or both?"

This patient entered the Hospital of the University of Maryland (Medical Service of Professor Pincoffs) on the last day of July of 1923. He is a man thirty-five years of age, and a chauffeur by occupation. He came complaining of weakness, loss of weight, swelling of his neck, tingling in his throat and pain in his eyes. When he was asked about the onset of the trouble he dated it back to 1919. He said that he had noticed then that he was getting weak and was losing weight, and about the same time he observed a fulness in his neck, which he believed to be enlarging. Soon afterward his eyeballs became more prominent than they had been and his eyes became painful. A short time after that he developed hæmaturia and consulted Doctor Colston, of the Johns Hopkins Hospital, who discovered on cystoscopic examination a bleeding tumor of the bladder. This tumor was treated with radium for a period of two months;



at the end of this time the hæmaturia had ceased and the tumor had disappeared.

The patient asserts that immediately after the treatment of the bladder tumor, all his other symptoms became greatly exaggerated. He feels sure that his pulse-rate became accelerated, the swelling in the neck increased, the protrusion of the eyes grew more marked and various other symptoms were worse after the treatment of the bladder with radium. Now, of course, it is not at all certain that the treatment of the bladder with radium was really the cause of the exaggeration of those signs and symptoms. It is quite possible that the exaggeration may have occurred in the natural course of development of an exophthalmic goitre and that the exaggeration of the symptoms was merely coincidental with the radium treatment of the bladder.

The history taken when he came into the hospital may now be examined as to its main points. The *family history* revealed nothing of special importance except that there had been some cases of "heart disease" and of "kidney disease" in the family; there was, however, no history of exophthalmic goitre, of tuberculosis, of syphilis, or of mental or nervous disease. In his *past history*, it was reported that in early childhood he had suffered from a number of infections, including measles, scarlet fever, diphtheria, whooping-cough and pneumonia. But a great many people have such a history of multiple infections without ever subsequently developing exophthalmic goitre.

During the past three years he has had a double otitis media with a purulent discharge; both drums had been perforated; when he came into the hospital the right ear was still discharging foul pus, although there was no longer any discharge from the left ear.

His habits had been interesting and they may throw a little light, perhaps, on the etiology. He had used alcohol in moderation and had smoked twenty cigarettes a day—an excessive amount of tobacco, unless the cigarettes were of the variety from which the nicotine has been removed. Did you know that both cigarettes and cigars from which 90 per cent. of the nicotine has been removed can now be purchased?

These "no-nicotine" cigars and cigarettes are not so bad a smoke. I recommend them sometimes to patients who are smoking too much and are being injured by nicotine but who are not willing to reduce

the amount of their smoking! They find in these no-nicotine products a welcome surrogate and through their use for a time it becomes easier to give up the excessive use of tobacco. Still more important, I think, for the patient before us is the fact that he gives a history of taking three cups of black coffee with each meal. Suppose one cup contains three grains of caffeine; if so, he has been taking some twenty-seven grains of caffeine a day! Caffeine is, as everyone knows, a powerful stimulant to the nervous system and it is conceivable that an intake of twenty-seven grains of caffeine a day for many years might easily upset a man's autonomic balance!

There are two other things on which I lay stress in taking the history of a patient suffering from exophthalmic goitre. One is psychic insult or shock, of which there is no special history in this case. The other is pyogenic infection, and this patient, as we shall see, was found to be suffering from multiple pyogenic infections when he entered the hospital.

On entrance a *physical examination* revealed the presence of several of the "eye signs" of Graves's disease, a marked degree of exophthalmos and that extraordinary "stare," which is one of the more important eye signs. Even without exophthalmos, this stare and a preternatural glistening of the eyeballs may be striking parts of the syndrome. Von Graefe's sign was marked; even now, though he is much better, there is marked lid lag, so that when he looks downward the white of the sclera shows between the cornea and the upper lid. (Fig. 2.) He also showed an insufficiency of convergence when he came in; his eyes do not converge very well now and he is unable to maintain the convergence (the so-called Moebius's sign). When he looks up, he does not wrinkle his forehead as normal persons do; that feature of associated movement is known as Joffroy's sign. (Figs. 3 and 4.)

Examination of the head further showed that he still had a discharge from the right ear, and that there was enough nasal obstruction to make him a mouth breather. Though his tonsils had been excised some time ago, stumps of them remained and were found to be infected. There were several snags of teeth that looked suspicious and there was pyorrhœa. It was noted, too, that there was erythema of the neck and upper chest. When, on examining a

FIG. 1.



Photograph of the patient with exophthalmic goitre after thyroidectomy, performed a few days after the clinic was held. The protrusion of the eyeballs and the wide lid-slits are still striking features.

FIG. 2.



Von Graefe's sign: The lagging of the upper eyelid and exposure of the white of the sclera between the cornea and the upper lid are well seen, the approximate time for the nine exposures reproduced being one and a half seconds. The pictures are to be examined from left to right and from above downward, the eyes following the marker, but with considerable lagging of the upper lid. (Enlarged from every fifth motion picture film, the pictures being taken at the rate of about thirty-two to a second.)



FIG. 3.



Joffroy's sign is positive in the patient; when he looks upward there is no transverse wrinkling of the forehead.

FIG. 4.



In this person with a normal thyroid gland, the forehead becomes transversely wrinkled when he looks upward; Joffroy's sign is negative.

patient, you look at the neck and upper chest and observe an erythema there, you should remember that this vasomotor disturbance is often a sign of hyperthyroidism.

On inspection and palpation of the neck, a marked struma (or goitre) was observable. The thyroid is, as you see, still enlarged; at present the right lobe is larger and more prominent than the left. The right lobe has been, I am told, larger than the left all through his illness. There is no definite isolated nodule to be palpated in the thyroid. We deal rather with a diffuse enlargement of the whole gland, involving it evenly except that the right lobe is somewhat predominantly involved. It is important to look for nodules in the thyroid, for if you find discrete nodules you can be fairly sure that you are dealing with thyroid adenoma, and when an adenoma of the thyroid is accompanied by signs of hyperthyroidism, you have to deal with an affection that differs markedly from the diffuse hyperplastic change associated with hyperthyroidism that we have here. The two diseases run different courses and the treatment required may be very different in the two instances.

In Graves's disease, tachycardia is a prominent and constant symptom. This man, on admission, had a pulse-rate of 134 to the minute. The pulse-rate fell somewhat after rest in bed, but it is still quite high, higher than usual, I may say, owing probably to excitement on coming into the clinic. There was violent pulsation of the vessels of the neck when he was first seen; and there was a distinct bruit over the thyroid—one could hear the blood rushing into the thyroid gland with each systole of the heart. The heart itself was a little enlarged. The blood-pressure has been approximately normal.

Tremor of the fingers was very noticeable on entrance; and you see he still has a mixture of fine and coarse tremors of the out-stretched fingers. There was also a little tremor of the feet, when the legs were extended in front of him.

*Physical examination* of the chest and abdomen revealed no marked abnormalities. Dulness in the thymus region was not apparently increased. The deep and superficial reflexes were present, and they were a little exaggerated.

The four cardinal symptoms of this disease, you will recall, are: (1) Struma or goitre, (2) exophthalmos, (3) tachycardia, and (4)

tremor. When these four symptoms are present you have the full-fledged Basedowian syndrome. And in addition to these cardinal symptoms, there are often the eye signs of which I have spoken, excessive perspiration, and marked muscular weakness. One of the best ways to test muscular weakness, when you suspect the existence of hyperthyroidism, is to ask the patient to step upon a chair; in order to raise himself to the chair he has to contract the quadriceps. And you will find that many of the patients with beginning hyperthyroidism have difficulty in doing this; they have not enough power in the quadriceps muscle to extend the knee sufficiently. (Figs. 5, 6 and 7.) Just why the weakness should be especially marked in the extensors in the thigh is not clear.

This patient is 5 feet, 11 inches in height, and weighed on admission only 122 pounds. He had during the preceding months lost twenty-four pounds in weight, despite the fact that he had been eating well. The emaciation in this disease is due, as you know, to a great increase in the rate of the oxidation processes in the tissues, to an acceleration of the metabolism. Many of the patients exhibit an excessive appetite and eat ravenously (bulimia; polyphagia) and yet undergo rapid emaciation.

The *laboratory tests* made upon this patient gave results that were interesting. The urine and fæces were normal. The blood showed a slight anæmia; the hemoglobin was 85 per cent. on admission, and later fell to 70 per cent. The white-cell count was practically normal; there was only a little relative lymphocytosis (30 per cent. small mononuclears), indicating probably that there is no marked thymus hyperplasia or lymphadenoid tissue increase. The Wassermann reaction was negative. Chemical studies of the blood showed 46 mg. per cent. of non-protein nitrogen (30 to 32 mg. per cent. would be about normal). He has only 80 milligrams of sugar per 100 c.c. of blood; there is thus a slight hypoglycæmia. The content of the blood in sugar is higher than normal usually in exophthalmic goitre, but in this man it is rather low. I think the reason for this is that he has had an acute hyperthyroidism and that the tissue demand for glucose-oxidation drew upon the carbohydrate content of the blood a little faster than glucose was mobilized from the glycogen storehouse in the liver. Now and then a marked hypoglycæmia is



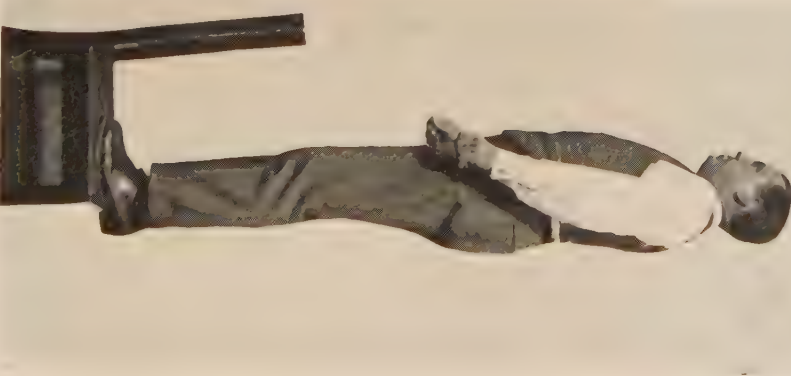
FIG. 5.



FIG. 6.



FIG. 7.



Stepping up from off the ground to a chair in order to show whether muscular weakness of the quadriceps muscle is present or not. Pictures of a normal person with one foot on the ground and the other on the chair, ready for the signal to start (Fig. 5); weight of body is now on right leg, with left leg in the air unsupported (Fig. 6); balance as normally seen in the final step of the test (Fig. 7).



observed in severe thyroid disease. Last February Dr. E. F. Holman reported a case in which there was an acute hypoglycæmic crisis after an operation for exophthalmic goitre; the blood-sugar went down to 48 mg. per cent. and the patient became slightly stuporous. If the blood-sugar falls to 40 mg. per cent. a patient will, as you know, go into coma and show convulsive twitchings. The importance of administering glucose *per rectum* or intravenously in such a case cannot be over-emphasized, for it is life-saving. You who have been treating diabetes mellitus with insulin are, of course, familiar with the dangers of hypoglycæmic stupor and convulsions from an overdose of insulin; in such cases, too, intravenous glucose is immediately restorative.

Several *examinations by specialists* have been made of this patient during his stay in the hospital. Thus, Doctor Looper, because of the long-continued purulent discharge from the right ear, reported that he suspected the existence of a mastoiditis on that side. He found a marked deflection of the nasal septum, which largely accounts for the mouth breathing; and he emphasized the finding of infected tonsils and infected teeth. The eye-grounds were quite negative. Both pupils react to light though the reaction is rather sluggish on the right side and the pupil on this side is wider than that on the left. The sluggish right pupil and its dilatation may depend upon an irritation of the sympathetic nerve on the right side.

When there is anisocoria and sluggishness of reaction of one or both pupils you should always think of the possibility of either lues or (since 1917) encephalitis. It is interesting that encephalitis can do the same thing to the pupils that syphilis can do. We have seen several cases of Argyll-Robertson pupils in patients in whom the Wassermann was negative but who had suffered from an attack of encephalitis. There is no history in the patient before us suggestive of encephalitis. Moreover, he states that he has not had syphilis and, as you have heard, the Wassermann reaction in the blood was negative, though the spinal fluid has not been examined.

The dentist reports that in addition to dental caries and pyorrhœa, there are several roots to be extracted; one of the latter presents a periodontitis at its apex in the X-ray film.

*X-ray examinations* were made by Doctor Walton, who corroborated

rated Doctor Looper's findings with regard to the paranasal sinuses. There was clouding of the ethmoidal and of the sphenoidal sinuses; the antra were entirely clear; the left frontal sinus was clear; the right was absent.

X-ray of the chest was negative for aneurysm, for substernal thyroid and for enlarged thymus shadow. (It is important to be sure about the latter.) Nor was there any sign of enlarged mediastinal lymph-glands. The lungs were clear. The heart was slightly enlarged and through the fluoroscope the tachycardia was evident.

*Basal metabolic rate* determinations were made by Doctor Love and Doctor Rhodes. Such tests are of the greatest interest in cases in which you suspect either over-activity or under-activity of the thyroid gland. On August 1st the basal metabolic rate was 73.6 per cent. above normal and on August 4th, even after a few days' rest in the hospital, it had risen to 78 per cent. above the normal rate for a patient of this age, sex and size. We know that if the basal metabolic rate is 70 per cent. or more above the normal that we must be dealing with a severe hyperthyroidism. In moderate hyperthyroidism one finds an increased rate of 50 per cent. above normal, or thereabouts. Some of the so-called *formes frustes* of Graves's disease exhibit no increased basal metabolic rate. One should be very cautious in interpreting syndromes that resemble the Basedowian syndrome in the absence of any acceleration of the basal metabolism. But when the basal metabolism is accelerated by more than 70 per cent., you know that you are dealing with one of the very severe forms of hyperthyroidism, and this man was an example of such a condition when he entered the hospital.

When thyroxin, which is believed by Kendall to be the thyroid hormone, is injected intravenously it increases the basal metabolic rate. It is probable that this substance acts as a catalytic agent and thus determines the rate of oxidation in the cells throughout the body. Of course, there are other conditions that influence the rate of oxidation; for instance, fever. It is asserted by chemists that with a rise in temperature of ten degrees the rate of a chemical reaction is accelerated so as to occur twice as rapidly. In febrile conditions of the body it has been proven that there is an acceleration of the basal metabolic rate. Both in health and in disease the chief regulator of



the oxidation of substances in the cells seems to be this substance derived from the thyroid, namely, thyroxin. Kendall estimates that from 12 to 14 milligrams of thyroxin are required throughout the body to maintain the normal metabolic rate, and that about one-half of a milligram of thyroxin is lost or destroyed each day in the body. Now in the patient before us, with a greatly accelerated metabolic rate, it is a reasonable assumption that thyroxin has been distributed throughout his body in amounts greater than the normal 12 to 14 milligrams. The finding of a markedly increased basal metabolic rate corroborated the diagnosis of exophthalmic goitre. The degree of acceleration found and the fact that the rate increased at first while the patient was at rest showed the clinicians that they were dealing with a very severe case, one in which operation ought not at the time to be considered. As long as the basal metabolic rate is very high and is increasing, surgical interference should be avoided.

The *diagnosis* made included (1) exophthalmic goitre (with struma, eye signs, tremor, tachycardia, accelerated metabolism, etc.); (2) under-nutrition (to the extent of forty pounds); (3) multiple focal infections, namely, (a) purulent otitis media of the right ear, (b) chronic infective tonsillitis, (c) chronic pharyngitis; (4) paranasal sinusitis, and (5) oral sepsis (with pyorrhœa and abscessed teeth). These several focal infections, however, were not very severe; nor were they outspokenly acute, for there was no polymorphonuclear leucocytosis, and no fever. There have been only two days when his temperature reached 100° F.; the body temperature was nearly always around 98°, scarcely ever above 99°. So though he had several focal infections and was, probably, being chronically poisoned by them, they were of rather a mild character. Attention to even mild infections is imperative, however, if the general health is not to suffer from them.

The treatment that was ordered was, it seems to me, wise. It included (1) complete rest in bed with careful nursing; (2) a diet that was very simple in nature but rich in calories (chiefly vegetables and milk, to which lactose was added; about 3000 calories in the twenty-four hours); (3) ice bags over the heart (tachycardia) and over the thyroid; (4) removal of focal infections; and (5) X-ray applications over the struma.

Within a few days the pulse-rate became much lower; the patient was quieter, and felt less nervous; his basal metabolic rate increased during the first few days but later decreased markedly. The discharging ear was irrigated with 1/5000 bichloride solution, and after each irrigation a few drops of a 5 per cent. solution of mercurochrome was instilled into the ear; under these measures the discharge gradually lessened. A spray of mercurochrome solution to the nose and throat quickly led to a subsidence of the pharyngitis. Later on, three or four roots of teeth were extracted, including the one that was abscessed; the socket of the latter was curetted. In other words, the attempt was made to remove some of the focal infections and to reduce the activity and to bring about subsidence of the other infections in several domains—nose, throat, ear and mouth. The patient was sent to the X-ray room from time to time for röntgenization of the struma. A little digitalis was given, but, as is usual in Graves's disease, this had practically no influence upon the tachycardia, though it may have improved the tone of the cardiac muscle.

[Charts were here thrown upon screen, to illustrate the effects of therapy.]

At this juncture, I should like to discuss briefly the *differential diagnosis* of exophthalmic goitre. In an outspoken case such as the one before you, there is of course no doubt of the existence of a typical Graves's syndrome with marked over-activity of the thyroid gland. But, in less typical cases, there may be a doubt regarding the existence of hyperthyroidism and clinicians have sought positive reactions that may be regarded as pathognomonic of the condition. There is only one reliable test for hyperthyroidism and that is the determination of the existence of an acceleration of the basal metabolic rate. The so-called "Goetsch test," which shows the presence or absence of a hypersensitiveness to epinephrin, has been advocated as a method of recognizing hyperthyroidism. If the pulse-rate per minute is increased by ten beats, or if the systolic blood-pressure rises ten points, the reaction is called positive. Such a positive reaction to the Goetsch test is certainly frequently met with in hyperthyroidism, but it is also observable in various other pathological states. A positive reaction to the Goetsch test is often demonstrable in conditions in which there is an autonomic imbalance. Hypersensitiveness of

the sympathetic nervous system, as revealed by the Goetsch test, is not a definite guide, therefore, to the diagnosis of hyperthyroidism. Nor is the blood-sugar curve a reliable guide to the diagnosis of hyperthyroidism. The general symptomatology, especially the presence of the four cardinal symptoms—struma, exophthalmos, tachycardia and tremor—permits us to recognize Graves's syndrome. When you observe two or three of these cardinal symptoms in a patient who has lost, or is losing, weight you think at once of the probable existence of hyperthyroidism. Then if you have a basal metabolic rate determination made and find this to be increased to 20 per cent. or more above the normal your probable diagnosis is corroborated and made certain. However, you may still be dealing with a toxic adenoma of the thyroid that is causing hyperthyroidism rather than with a hyperthyroidism associated with diffuse hyperplasia of the thyroid gland, which is the condition present in classical exophthalmic goitre. If an adenomatous condition exists you will find one or more nodules that are definitely palpable in the thyroid gland. It is an interesting fact that if the nodule or nodules be simply "shelled out" by the surgeon, the symptoms of hyperthyroidism usually disappear quickly. The average duration of hyperthyroidism associated with diffuse hyperplasia of the whole thyroid gland is probably two or three years, no matter how you treat it (medically, surgically or radiologically). You may, it is true, compel a subsidence of the symptoms by treatment but rarely a cure until this time has elapsed; moreover, after recovery from one attack, these patients are prone to recurrences in later life. There are profound disturbances both of the nervous system and of the endocrine apparatus in exophthalmic goitre, and though we are now in possession of helpful remedial measures, it is extremely difficult to free these patients entirely from symptoms. The majority, it is true, can be restored to ordinary life (provided certain hygienic rules are strictly obeyed), and even to economic productivity; but they require the most careful medical supervision throughout the rest of their lives and should be so instructed. More of this, however, when we come to the discussion of treatment.

What can be said regarding the nature of this remarkable disease? Of course, we have long known that in it there is a disorder of the

thyroid gland, and the thyroid is an endocrine organ. But exophthalmic goitre is certainly not a uniglandular endocrinopathy. There is evidence that more than one endocrine organ is involved in the disorder. In most cases of exophthalmic goitre the thymus persists and often it is hyperplastic. In many patients, a thymus shadow is visible in röntgenograms of the chest; sometimes thymus dulness can be made out on percussion. Again, many of the patients show symptoms and signs that suggest an over-activity of the suprarenal glands and, as well, a deficiency of the internal secretion of the gonads. Exophthalmic goitre is now looked upon as a pluriglandular endocrinopathy with involvement of the thyroid, the thymus, the gonads, and the suprarenals. Indeed, in many of the endocrinopathies formerly supposed to be of uniglandular origin, more or less involvement of several of the hormonopoietic organs is believed to exist. Moreover, there is in exophthalmic goitre profound disturbance of the nervous system, especially of the autonomic nervous system. Some of the symptoms suggest sympathicotonia, others vagotonia. Attempts to divide the cases into those that are more sympathicotonic and those that are more vagotonic have not been very successful, though they are interesting to examine. The functions of the brain itself are often disturbed in this disease. The patients all exhibit psychoneurotic phenomena; they are nervous, restless, over-alert, and easily frightened, and they often suffer from insomnia.

Now, what is the primary site of the disease? We really do not know. It is not likely, I think, that the primary site is in the thyroid. I am inclined to look upon the hyperplastic struma and the overproduction of thyroxin as a result of some pathological process elsewhere. It seems fairly certain that persons who develop exophthalmic goitre are congenitally predisposed to the disease; they are pathological personal variants that have resulted from faulty heredity; a constitutional inferiority of genotypic origin must be predicated. Among the environmental factors that may be of etiological importance, psychic insults may be mentioned first. I saw a man in Chicago, when I was living there, who on one day lost several thousands of dollars in the stock market; within twenty-four hours after the psychic insult—which was also an economic insult—he developed a full-blown Graves's syndrome! Of other possible environmental



etiological influences, infections and intoxications may be important. A large proportion of hyperthyroid patients are found to have infected tonsils, sinuses or teeth. One could view such infections in either one of two ways; thus one could think of the infections being primary and the neuro-endocrine disturbances as secondary or one could assume that patients with over-activity of the thyroid gland are more susceptible to infections than other people; perhaps a vicious circle exists. Among the poisons that have been incriminated may be mentioned caffeine, nicotine, and the extractives of meats. In considering etiology, it should not be forgotten that women are far more frequently affected than are men. Can this fact be correlated with the greater emotional lability of the female sex? Many believe that disturbances in the nervous system precede the glandular and circulatory disturbances and conceive of the disease as a neurosis. That is about where we are to-day, as far as the nature of exophthalmic goitre is concerned! We do know, however, that irrespective of the primary disturbance and of the exact sequence of links in the pathogenetic chain the thyroid gland becomes over-active and undergoes hyperplasia and that this is associated with an increased rate of combustion in the cells of the body.

Finally, let us consider current opinions regarding the best methods of treatment of this disease, for this is perhaps of the greatest interest to the general practitioner. Opinions are divided; some advocate surgical treatment, others medical treatment and still others combined medical and surgical treatment of this disease.

*Surgical Treatment.*—For a long time the only treatment known for exophthalmic goitre was medical, but, later on, the surgeons proved that rapid amelioration of symptoms could in many cases be achieved by thyroidectomy, by ligation of the arteries, and by injection of hot water into the gland, but the mortality rate from the surgical operations was at first very high. Recently, by excluding the most severe cases from operation, by carefully preparing patients for operation, by the introduction of ligations of arteries or of hot-water injections as preliminary measures, the mortality rate from surgical operation in skilled hands has been reduced to a very low figure. There is some risk incurred always, of course, on surgical interference. You can never be quite sure that you will not meet with an

acute hyperthyroid crisis immediately after an operation, and if it should appear, life may be endangered. Moreover, many of these patients, particularly those with thymus hyperplasia, do not stand anæsthesia well. There was a time when surgeons tried to do without general anæsthesia during thyroidectomy. Some surgeons still advocate local anæsthesia but the consensus of opinion seems to be that ether anæsthesia is best and safest. There are certain rules about operation in Graves's disease that surgeons now generally follow. One rule is: Never operate on a very acute case, especially one in which the basal metabolic rate is 70 per cent. increased, and particularly if the metabolic rate is increasing while the patient is at rest. A second rule is: Never perform thyroidectomy upon an insane patient. Other rules point to the dangers of operation in patients who are profoundly asthenic, or who are greatly emaciated, or who suffer from serious organic visceral disease, especially from graver forms of heart disease. If there is an enlarged thymus, visible in the X-ray plates or demonstrable on percussion, the operative risk is increased. Or if minor surgical procedures are not borne well, it is better to avoid the major operation of thyroidectomy. It may be mentioned, too, in passing, that it has been found that the Jewish race shows a higher mortality from this operation than do the non-Jewish races.

*Medical Treatment.*—As to medical treatment, it should consist of rest, diet, hydrotherapy, pharmacotherapy, psychotherapy, and röntgenotherapy or radiotherapy. I lay great stress upon the importance of both physical and psychical rest instituted early. If the patient can take the rest away from her own home, say in a quiet hospital or in a well-organized nursing home, the results are often better than with domiciliary treatment. A good nurse is most helpful; she will attend to the detail of diet, baths, massage, and ice-bags over heart and thyroid and will keep records of pulse-rate, temperature, blood-pressure and subjective symptoms. The diet is believed to be important. All agree that meat should be cut off, and especially meat extractives (in soups, etc.). Carbohydrates may be given freely. Coffee, tea, alcohol and tobacco should be prohibited. It is a question whether fat should be given in abundance or not. I usually permit a free intake of both carbohydrates and fats but

keep the protein intake low. Concerning the diet in exophthalmic goitre a very interesting article by Hans Curschmann appeared recently in the German literature. This author states that during the war exophthalmic goitre almost disappeared from the German clinics. During the "hunger period" in Germany there were not one-quarter of the number of cases that they saw before the war; but since the war the disease has been reappearing. Now, you will recall that during the war the Germans had practically no meat to eat; few persons could secure more than one or two hundred grams of meat per week. They had more carbohydrates, but very little fat—no butter and no cream—and their total caloric intake was very small, averaging not more than 1500 to 1800 calories *per diem*. Curschmann very naturally asks the question: May it not be possible that the best treatment of this disease is the diet of the hunger period of the war, or, at any rate, a diet simulating that? Might not the patients do better if they eliminated meats and fats from the diet and kept the total caloric intake small? He merely suggests this, basing the suggestion upon those interesting observations of lessened incidence during the war. Our experience has been favorable to the fattening of hyperthyroid patients, by permission of an abundant fat and carbohydrate diet with restriction of meat and meat extracts; as their weights increase they feel better; I should, therefore, hesitate to try a "war diet" until we know more, though I pass Curschmann's suggestion on to you in order that you may give it due consideration.

Radium over the thyroid and thymus, or X-rays over these glands, may be, in many cases, as efficacious as surgery. Perhaps I should not say that out loud! However, I am inclined to think that the statement is true, provided always that radiotherapy is properly applied. Some surgeons object to radiotherapy because they assert that it causes perithyroiditis with formation of adhesions, which make surgical operations upon the gland later more difficult. At the same time, I find that more and more surgeons are resorting to it as a preparation for operation. Radium is somewhat more difficult to apply than the X-ray and is not everywhere accessible in sufficient quantities. The thyroid and the thymus should, I think, be treated simultaneously. On applying X-rays, the radiation is arranged so as to pass through an opening extending from the aural canal down

as far as the lower pole of the thyroid, thus reaching the thyroid and the tonsils at the same time, as well as the lymph-glands in the neck. First one side is radiated and then the other side (cross-fire). Antero-posterior radiation reaches thyroid and thymus simultaneously. Exposures may be made weekly or twice a week at first, as long as the dose given is not too strong; then, once every two weeks, once every three weeks, once a month, and once in two months. Systematically and skilfully applied, treatment by X-rays or by radium seems to be very beneficial. Drugs are of but little avail except as palliative measures and, perhaps, as retarders of metabolism. Bromides may be given to quiet the nervousness; adalin or luminal to overcome insomnia; arsenic and quinine hydrobromate to slow the metabolism; or ergotin as a vasoconstrictor of the thyroid vessels. Judicious psychotherapy is exceedingly important in the management of the patients. Hydrotherapy in the form of tepid baths may be helpful in combatting insomnia and in allaying nervous restlessness. If I had the disease myself I should rest and try to gain weight; I should have X-ray or radium treatment; and, then, if after a few months of such treatment I did not improve, I should consult a skilful surgeon. For it is important not to allow a thyreo-intoxication to continue too long, on account of the injury that is done to the heart, the sex glands, and the nervous system. The patient before you is to be operated upon by Doctor Shipley in the near future.



## HEART DISEASE IN CHILDREN—INFANTILE CEREBRAL PARALYSIS \*

By J. P. CROZER GRIFFITH, M.D.

Professor of Pædiatrics, University of Pennsylvania, Philadelphia

You remember the child we had before us last week; a patient with chronic cardiac disease. I cannot bring her here to-day, because the condition of her health was so good that she has been discharged and has returned to her home. I should like, however, to make her case a text, so to speak, for some things I wish to say to you regarding chronic valvular disease as it is seen in children. Let us review briefly her history and the clinical findings. It should be said here that there are a number of gaps wanting in this history, and some discrepancies also, due to the imperfect knowledge of English and perhaps a general lack of intelligence on the part of the parents. This makes the case, however, more interesting, in a way, since it forces on us the drawing of inferences.

The child, a girl of eight years, of Italian parentage, was said to have been well until she attained the age of four years. At that time she suffered from some spitting and coughing up of blood, but as it was stated that she also had nose-bleed, it is likely that the blood depended entirely upon epistaxis. One would gather, too, that at the same time with this attack her feet were observed to be somewhat swollen and painful. She was in bed for two weeks. It is not certain what the general condition of her health was in the years which followed, except that she is said to have had pain in her side when she ran, and that she got out of breath. This is not very conclusive, inasmuch as many healthy children experience this, and there does not appear to be any distinct history of a loss of compensation even at the onset. She was in bed, then, not as a result of symptoms of decompensation, but on account of the pain in the feet. So, too, there is likewise no positive history of an acute articular rheumatism of any moment. A severe attack took place last May, and she was in bed

---

\* Clinical lecture delivered at the Hospital of the University of Pennsylvania, November 3, 1923.

for two weeks. In this she again had spitting of blood, nose-bleed, and pain and swelling in her feet. After that time she continued apparently in entirely good health until a week before her entrance into the hospital, which occurred on October 3, 1923, when she had a great deal of spitting of blood, it being uncertain whether she also had epistaxis. There was no history of cough, dyspnoea, cyanosis, and the like. Her knees are said to have been swollen. On admission to the hospital she did not seem to be ill in any way; in fact she was in excellent general health except for some degree of pallor. Part of this last might have been due to the natural color of her skin characteristic of her race, since her lips were quite red. The examination of her blood, however, showed an actual anæmia of moderate degree, the hemoglobin being 58 per cent., and her red cells 3,460,000. When she left the hospital on October 28th, the hemoglobin had increased to 72 per cent., and the red cells to 4,250,000. While in the hospital there were no signs whatever of any disturbance of compensation. On physical examination of her heart the apex beat was found in the fifth interspace, outside of the nipple line. The impact was not unduly forceful. Percussion showed the heart enlarged somewhat to the left and slightly to the right. Auscultation revealed a rather interesting condition. There was, namely, a quite loud systolic murmur over the base and at the apex and transmitted distinctly to the axilla, having all the characteristics of the murmur of mitral insufficiency. A second loud murmur, diastolic in time, was heard at the upper part of the sternum and extending down this bone, and having the features of aortic regurgitation, except that it was not as widely diffused as a murmur of that nature frequently is. There was still, apparently, a third murmur. This was also diastolic, but occurred later in the cycle than the previous one, occupying, in fact, the latter part of the diastole. It was heard most distinctly to the left of the sternum and was transmitted somewhat towards the apex. Although the centre of the intensity was not as near the apex as is usual, its character and its lack of diffusion still seemed to indicate that it depended upon a mitral stenosis. That this was really the case could not be positively determined, of course, in view of the evidence of aortic regurgitation, since it might have been an instance of the murmur to which the name of Flint is usually attached.

There were some data connected with the diastolic murmur supposed to be aortic which were not quite in accord with the diagnosis. There was the absence of the trip-hammer or Corrigan pulse observed in this disease, and there was also no evidence of a capillary pulse. Both these conditions might be explained by the fact that the aortic regurgitation in this case was not of great severity, and that in addition the mitral insufficiency diverted the full course of the blood, so that instead of passing forcibly from the hypertrophied ventricle into the aorta, part of it regurgitated through the diseased mitral orifice, and in this way the great and sudden force which is in part responsible for the trip-hammer and capillary pulse was diminished.

Considering everything together, it seemed we were justified in believing this to be a case of the combination of three murmurs—that of mitral insufficiency, mitral stenosis, and aortic insufficiency.

Let us now turn to the study of the subject in general, as illustrated by this case. When we find a child with a persistent heart-murmur, our first duty is to attempt to assign this to one of three categories. That is to say, is it (1) congenital, (2) accidental, or (3) due to chronic valvular disease? I will not discuss in this connection the murmurs of acute endocarditis or pericarditis. Suppose we take up first of all the subject of diagnosis with regard to these classes, as illustrated by the case of our little patient. Congenital murmurs, of course, vary, but have on the whole much in common. Almost always they are systolic in time; they are likely to be accompanied by a thrill and by cyanosis; they are not, as a rule, attended by enlargement of the heart to the extent one observes in cases of acquired cardiac disease. A very large percentage of them depend upon a perforation through the ventricular septum, which is liable to be combined with stenosis of the pulmonary orifice, and often, as a compensatory condition, by a patulous ductus arteriosus. As I have said, congenital heart-murmurs are nearly always systolic. The only diastolic murmur of moment is that sometimes heard in cases of patulous ductus arteriosus, and this may be accompanied by a systolic murmur as well, making the sound almost a continuous one, and producing what has been called the “humming-top” murmur. Let us apply all this to the case of our little patient. We do not know when she first exhibited a murmur. If before the age of four years,

it might well be evidence of congenital cardiac disease. Further, she did not experience much enlargement of the heart or the Corrigan pulse, and these, too, might support the view that the disease was congenital. On the other hand, there is no murmur, or combination of murmurs, that I have heard in congenital heart disease, which would accord with the condition which our patient exhibited. The distribution of the louder diastolic murmur is distinctly that of aortic regurgitation, and this, except for very rare occasions, is always an acquired disorder. We may, I think, safely rule congenital heart disease out of consideration in this case.

Next in order come the accidental or functional murmurs, prominent among which is that due to anæmia. These are of very frequent occurrence. Lüthje, for instance, found a functional murmur present in 71 per cent. of 864 school-children examined. These murmurs are practically always systolic in time. They are heard loudest at the base or along the left border of the sternum or at the pulmonary cartilage. They are not loudly transmitted, except in the case of severe anæmia, when they may be quite loud and widely diffused. Is it possible that the murmurs in the case of our little patient could be put in the accidental class? Clearly not. Her anæmia is hardly great enough to produce the systolic murmur, and a murmur diastolic in time does not, as I said, belong to the accidental class. This leaves us, then, only chronic valvular disease as the condition, and we already have seen good reason for believing that our patient belongs in this class.

Now having satisfied ourselves that the murmurs which we may in any case happen to hear belong to the group of those due to chronic valvular disease, our next aim always should be to discover the probable cause. The condition is, of course, naturally a sequel to an acute endocarditis, which may, it must be remembered, have been very mild or may even have entirely escaped observation. Last week we considered a little the relationship of chorea to rheumatism. To-day we must touch upon that which exists between rheumatism and heart disease. When a child under the age of five years develops an endocarditis, the likelihood is that it is not associated with rheumatism, since that disease is so uncommon at this period of life. More probably the cause may have been pneumonia, scarlet fever,



or some other infectious disease, including septicæmia. After the age of five years, investigations show that probably 75 per cent. of the cases of endocarditis depend upon rheumatism. This statement does not necessarily mean that the child has suffered from an earlier attack of acute articular rheumatism. The rheumatic manifestation may have been torticollis, or possibly tonsillitis, if we allow this sometimes to be an evidence of rheumatism and not the cause of it, or chorea, or the endocarditis may have been the primary rheumatic affection; rheumatic, as shown later by the tendency to distinctly rheumatic symptoms in other parts of the body. In the case of our little patient we are unable to determine what the primary manifestation was. In spite of the fact that she was less than five years of age, it seems very likely that the painful swelling of the feet, which was noticed at the age of four years in her first attack, was really rheumatic in nature. Whether or not her heart-murmur developed at that time, or earlier or later, we have no means of determining. That the affection of the feet was rheumatic seems to be borne out by the history that she was subject to later attacks; and in spite of the fact that we have no history of the occurrence of any distinctly acute endocarditis, or even of any positive proof of a loss of compensation, at some time in the past years the child had clearly developed an endocarditis. We do not know, too, with any certainty whether the epistaxis was the result of the endocarditis or not. From its early occurrence and frequent repetition, without the evidence of any other manifestations of passive congestion, I am inclined to doubt any such association.

To discuss chronic valvular disease in its entirety would require much time and be entirely apart from the object which I have in view. I want to take up only some of the characteristics in the matter of the lesions, symptoms, prognosis, and treatment as appertaining to children as compared with adults. First of all, the lesions. In this connection let me give you a few statistics. In 150 fatal cases of chronic heart disease reported by Lees and Poynton, the mitral valve was found at autopsy involved in 149. In the 150th case no lesion whatever was discovered; so we can properly say that in every one of these cases of valvular lesion the mitral valve was diseased. A lesion of the aortic valve was present in 51 instances, but always

in combination with lesions of the mitral. There was not a single case where the aortic valve alone was affected. These statistics are of lesions found at post-mortem examinations. Let us turn now to certain other statistics involving the clinical examination. Dunn, of Boston, studied 262 cases of valvular disease resulting from rheumatism. The examinations were made some years after the first development of endocarditis. The evidences of mitral insufficiency alone were found in 165; of mitral stenosis alone in five; in all the cases, except one, symptoms indicating mitral disease were present, and this one appeared to be an aortic insufficiency. Of course we do not know whether post-mortem examination would have shown that the mitral valve was involved in this also. Still, of London, gives us the analysis of 250 cases studied clinically. Here mitral insufficiency was found in 241, and evidences of stenosis in 124 of these.

We may reasonably conclude, then, from the figures I have given, that in chronic endocarditis in childhood the mitral valve is involved in practically every instance, and that in nearly all of these the lesion is mitral insufficiency, with or without stenosis. Mitral stenosis alone seems to occur very infrequently in childhood. This is in sharp contrast with the findings in adults, in whom mitral stenosis quite frequently occurs alone, or is certainly the predominating lesion. Aortic insufficiency, even when combined with other lesions, is of much less common occurrence in children than in adults. Aortic stenosis practically is not found in childhood. Clinical evidences of it were observed in only two out of 500 cases of heart disease in children reported by Lees and Poynton; and here it is to be remembered we lack the positive proof given by a post-mortem examination. What is the conclusion from this last fact? It is this: That when in the case of a child we hear a systolic murmur situated at the aortic cartilage and transmitted into the vessels, we should never conclude that we are dealing with an aortic stenosis, unless there is no other conceivable explanation. Perhaps the murmur heard in the carotids is not transmitted from a stenosed aortic valve but depends upon anæmia; or perhaps an enlarged gland or some other entirely anomalous condition may cause a murmur by pressure. In any event, it is almost certainly not dependent upon an aortic stenosis at this time of life. Tricuspid lesions we need not consider. Stenosis

is always extremely rare at any period of life, and insufficiency may occur in childhood, as in adult life, dynamically as a result of dilatation of the orifice secondary to other cardiac disease.

Next we have the symptoms as seen in childhood. These vary, depending upon whether compensation is present or lost. I will not consider the latter. The symptoms are much the same, no matter what the lesion may be. They are those of venous stasis, and they do not differ materially in any way dependent upon the age of the patient. When, however, compensation has not been lost, we find that not infrequently the child is capable of going on for months and years without any symptoms whatever, in spite of the fact that he is living, perhaps, an active life; one, indeed, in no way differing from that of a healthy child. This is due to the fact that in childhood the heart-muscle is young and strong and able to stand a great deal more than the adult heart can. In such cases the lesion is discovered purely by accident, the child being examined by the physician on account of some other diseased condition. In other cases we may have a continuous or a frequently recurring very slight disturbance of compensation, manifested, perhaps, by a little shortness of breath, palpitation, epistaxis, cough, indigestion, headache, or anæmia; not all these symptoms being necessarily present in any one case. Our examination of the heart shows us that there is a cardiac lesion, but how are we going to determine in the mildest cases that there is really a loss of compensation? Our course must be modified here a little in accordance with the age and understanding of the child. It would be foolish, for instance, to ask a little patient whether he has palpitation of the heart. He hasn't the faintest idea what that means; and if, indeed, he has felt anything unusual of this sort, he is not conscious that it is an abnormal condition, because he is quite accustomed to it. So, too, we cannot ask such a child whether he has shortness of breath. If he has long had moderate disturbance of compensation, he is quite used to this symptom and looks upon it as a natural condition, knowing nothing else. We must get at it in some other way. Sometimes I ask a boy whether he can run as fast as his school-mates. You may be pretty sure that if he can, he will claim this ability; and even if he can't he may be a little slow to admit it. Certainly if he says that he can not, we are justified in

our suspicions that his inability is due to a dyspnœa. Then we often notice that children with a persistent slight loss of compensation have, without knowing why, accustomed themselves to quiet games. They like to sit around and play with toys, and the like, rather than join in the active sports which the healthy child enjoys. Finally we note the anæmia. It is a curious fact that children with chronic cardiac disease are particularly prone to a degree of anæmia for which we can find no cause other than the cardiac condition, and which is often extremely resistant to treatment. The existence of such an anæmia renders us suspicious that it is the heart which is at fault, and that the symptom is really in a way an evidence of lack of compensation.

Now a little about the prognosis of heart disease as applied to children. This is from one point of view good, even when the compensation is badly broken. It is perfectly astonishing what powers of recovering compensation a little child has as compared with an adult. This is due to the strength and youth of the heart-muscle to which I have already referred. Cases which seem almost hopeless may regain their compensation and retain it for long periods. On the other hand, there are some very disturbing factors in our prognosis. First is the fact that acute cardiac dilatation develops quite readily in early life. Then most important is the great danger of recurring attacks of acute rheumatic cardiac disease to which children are especially predisposed, each attack leaving the heart a little worse off. Finally there is the oncoming of puberty, when, owing to the rapid growth of the body, the strain upon the heart increases and compensation may be lost. Our prognosis, therefore, for the final outcome must be guarded. As to the time in life when the disease may prove fatal, it is to be noted that we do not get many deaths from heart disease until well on in later childhood. When the lesion is slight and well compensated, and the child has reached puberty with but little disturbance, the prognosis is not unfavorable if a properly safeguarded life can be attained.

In general it may be said that the prognosis depends upon the age, the general health and the severity of the symptoms, more than on the valve involved. Yet the nature of the lesion exerts some influence. That of mitral insufficiency is the easiest to compensate



while childhood lasts. Mitral stenosis, if occurring alone, is of slow course and life may be much prolonged. As adult life is approached the stenosis is liable to increase and more trouble to arise. Usually, however, the attending mitral insufficiency determines the prognosis. Aortic insufficiency, if the predominating lesion, is capable of lasting a long time with little if any disturbance of compensation.

A question arises here of very great practical importance; namely, what shall we tell the parents when we discover that a child shows evidences of chronic valvular disease. Most mothers have heard something about heart-murmurs, perhaps called "leaks," and are very much frightened if told that such a condition is present. You do not want to alarm her, and you feel disposed to say nothing about it; but if you have discovered a valvular lesion and do not tell the mother, you may be pretty sure that some other physician sometime certainly will, and then it becomes a distinct reflection upon you. Not only, then, for self-protection, but because, as a matter of fact, a mother has a right to know what ails her child, I think it better to indicate your knowledge that a murmur is present. There is, however, no use in being pessimistic in your statements, merely because you have heard a murmur. First of all, even if it is organic, it may never do the child harm; and then, too, you may be mistaken in your diagnosis, and the murmur may be merely an accidental one. I recall a very interesting instance in the much-adored and only child of anxious parents. When he was about a year or a little over a physician who saw him on one occasion told the mother that he had a murmur, without further explanation. You can imagine the result! My own study of the case convinced me that the murmur was purely accidental and depended upon anæmia. A blood examination confirmed this. The boy is now probably seven years of age, perfectly healthy and without any sign whatever of anything wrong about his heart.

As to treatment, I have nothing at all to say regarding that of loss of compensation. It is practically identical with that you would employ for an adult. The question arises what you are to do in the case of children who have perfect compensation, or in those who lose it only slightly from time to time. Such children should be always under medical supervision. In our efforts to preserve compensation

it is the physician's business to arrange the whole method of life. Much time should be spent in the open air; chilling of the body should be avoided, as should mental overwork and bodily fatigue. On the other hand, nothing must be done to create the feeling of chronic invalidism. There is no reason in my mind why a child whose compensation is always good should not be allowed to take part in nearly all the active games in which his comrades share. There are certain restrictions about this, it is true. We want to avoid either a very violent and sudden or a very prolonged strain. Most boys with a chronic cardiac disorder, no matter how well compensated, ought not to go into such contests as the mile run and the like, nor should they do anything which throws a sudden, severe strain upon the heart. The ordinary active games, however, ought to be participated in. Supervision is especially necessary as the child approaches puberty. In the instances where there is a constant slight disturbance of compensation we must be guided largely by the individual case. Rest in bed for a part of every day is always well. Efforts must be made to combat any anæmia which is present. Recurrent attacks of rheumatism with subsequent endocarditis must be shunned as far as possible, perhaps by having the child spend the bad season of the year in a warm climate. If there is much disturbance of compensation, the child must, of course, go promptly to bed and be kept absolutely at rest until the conditions have improved. When he gets up exercise must be commenced carefully; first allowing him to sit in a wheel chair, then to wheel himself about a little, and then to walk. A failure to supervise exercise properly in these cases is one reason why so many of our children who leave the hospital in good condition come back to it so soon with compensation again disturbed. It would, however, be a great mistake, in my opinion, to keep cases of persistent but slight disturbance of compensation all the time in bed. Such a course merely weakens the heart-muscle. As I have said, it is an individual matter, and the physician must use judgment as to when and to what extent he will allow his patient to practise moderate, gentle exercise.

#### CEREBRAL DIPLEGIA

In the short time remaining to us I want to show you the baby, an abstract of whose history I will give you. It is a female child,

now six months old, and is one of twins, the other having been still-born. Labor occurred, as far as we know, at full term. The initial weight is not known, but, as you see, the baby is still quite small, weighing only ten pounds. The child cried immediately after birth, there being no history of a long-continued delivery or of any asphyxia. It was soon noticed that the infant had spells of crying lasting five or ten minutes, at which time it grew stiff in its extremities. This in itself is a record of no moment; but it was soon further observed that more or less rigidity was constantly present. Convulsions also occurred at times. As you examine the child you will notice that the head and the neck are very stiff, and that whenever the child is disturbed the head is drawn far to the back and the spine arched very much in the position of opisthotonos. The legs and arms are quite stiff; the knee-jerks are decidedly exaggerated. The child takes no notice of its surroundings. It is, indeed, an idiot, and it is doubtful whether it can see, although there does not appear to be any defect of the eyes. You will observe especially that the infant is able to move the arms and legs well in various directions when it cries.

I show you this case not because it is an uncommon one, but because it is one likely to cause confusion in diagnosis unless we are on the alert. It is undoubtedly an instance of what is known as "infantile cerebral paralysis," and yet, as you see, there is really no paralysis in the ordinary sense.

For us to consider together the subject of infantile cerebral paralysis would extend far beyond the time at our disposal. My only object in exhibiting the child is to prevent your making the mistake I have often seen made, *i.e.*, that of failure entirely to recognize the nature of the difficulty, on the ground that the term "paralysis" must really *mean* paralysis in the narrower sense of "lack of power." This case is one of those in which the element of paralysis is at a minimum and that of spasticity at a maximum; and yet it really belongs in the same category as do the cases where paralysis is very evident at the first inspection. Should this child live, we should probably be able to discover after a while that some degree of paralysis was actually present in some parts of the body; and yet not

necessarily so. You will repeatedly find cases like this in which the strength seems perfect, but there is enormous loss of control.

Viewing cases of infantile cerebral paralysis as a whole, we may well divide them, according to Sachs, into three classes: (1) Those which began before birth, *i.e.*, the antenatal cases; (2) those developing at birth; and (3) those acquired after birth, the acute postnatal cases. The causes which produce the difficulty vary accordingly with the time of their action. In those cases arising before birth, *i.e.*, the paralysis of intra-uterine origin, we have usually some developmental defect in the brain. At autopsy we may find large cerebral defects which go under the name of porencephaly; or there may be some imperfect formation of the pyramidal tracts. In many instances there is nothing visible to the naked eye, but microscopically there is found to have been a widespread lack of proper development of the cells of the cortex. This deficiency is designated *agenesis corticalis*. In the paralysis of the second type, *i.e.*, that produced at the time and through the process of birth, the cause is entirely different and is of a traumatic nature. Oftenest in these cases we find a meningeal hemorrhage which may be on either one or both sides and may affect either the vertex or the base of the brain. It is interesting to note that hemorrhage into the brain-substance itself is of distinctly rare occurrence. The meningeal hemorrhage may be caused by pressure of the forceps, but is very much oftener the result of a slow and difficult natural delivery. This, it is to be noted, is not always brought about immediately by the direct pressure itself, but by the sudden change from severe pressure to the relief of this, which allows a sudden determination of blood to a part of the brain which had been rendered anæmic; and as a result of this the vessels break. In premature infants there is a special tendency to meningeal hemorrhage in spite of the fact that, on account of their smaller size, no unusual pressure from the genital tract of the mother has occurred, and in this narrower sense the condition is not traumatic in origin. The hemorrhage takes place in these cases because the vessels have not yet fully developed their resisting power, and the ordinary congestion incident to birth was too much for them and they give way. Of course after hemorrhage from any cause, later changes take place, such as sclerosis, atrophy, chronic meningo-encephalitis, and the like.



The third class of cases occurs after birth, and is not directly dependent upon it. Here again meningeal hemorrhage is a common cause; and in addition we have such conditions as thrombosis and embolism, as well as encephalitis, the latter being the result of infectious disease or, perhaps, gastro-intestinal disorders. Thrombosis is more common than embolism, and meningeal hemorrhage the most common of all. Cases of this third class may occur at any time after birth, but are much the oftenest seen in infancy and early childhood. There is another condition which is probably a cause of meningeal hemorrhage in many instances of acquired postnatal paralysis. This has awakened a great deal of discussion recently. I refer to a certain hemorrhagic diathesis which appears to exist especially in the newborn. This may show itself as a distinct disease, sometimes with a tendency to hemorrhage in other parts of the body, although that taking place only in the brain is much the most frequent. This hemorrhagic tendency has been shown to depend upon a difference in the character of the blood, which may often be observed in the early weeks of life. How often hemorrhage is due to this cause and how often to trauma has not yet been well determined.

When we come to the relative frequency of these different forms of infantile cerebral paralysis, we find those of the second, *i.e.*, the birth palsies, very much more frequent than are those of intra-uterine origin or those called the "postnatal palsies." In which class does our patient belong? I should think we may without hesitation say that the paralysis was not postnatal. There is no history of stupor or especially of convulsions soon after birth, or any disease to which the paralysis might be secondary. Some of these reasons make it unlikely, too, that the paralysis developed during birth. The labor was not difficult or prolonged as far as we can learn, and the absence of asphyxia immediately after birth, or of convulsions or other cerebral symptoms at that time, make a birth palsy unlikely. Everything points to a prenatal diseased condition of the brain, the exact nature of which we cannot determine.

For convenience of study we also divide paralysis according to its localization, *i.e.*, first, hemiplegic and, second, diplegic or paraplegic. In infantile hemiplegia the paralysis, as the word implies, is

situated on but one side of the body, because the lesion occurred only upon one side of the brain. When the lesion is bilateral we naturally have diplegia or paraplegia resulting; the former when it affects both sides of the body throughout, the latter when only the lower extremities are involved. Probably nearly all the cases of paraplegia were diplegic at first, the symptoms disappearing later in the upper extremities and leaving only the lower ones affected. The infantile hemiplegic cases exhibit actual paralysis in a quite well-marked form, although naturally of a spastic type. In the diplegic cases the evidences of paralysis are very much less prominent than are those of spasticity. The pictures of the two conditions, hemiplegia and diplegia, are often as different as possible, and yet, as I said, they are only different representations of the same general class. Hemiplegic cases are far more commonly observed than are the diplegic ones; and yet it would be a mistake to conclude that originally this was the natural relationship. The life of these diplegic cases is often quite short, and there is reason to believe that in reality the number of them in infancy equals or exceeds that of the hemiplegic; although as far as statistics go, based upon children studied later in life, hemiplegia much exceeds the other form.

There is no time for us to study the symptoms more in detail, nor to discuss the diagnosis and prognosis. As we have seen, a very great many of the diplegic cases die early. This is perhaps a fortunate circumstance. The outlook for them is very unpromising should they survive. The hemiplegic case can often get along fairly well and become a useful member of society; whereas the diplegic case is likely to be a confirmed and useless invalid. I have not infrequently seen cases of this condition in which the child was absolutely unable to make successfully any attempted movement on account of the high degree of rigidity and defective incoördination. Still worse than this in the matter of prognosis is the fact that, although some degree of mental defect not infrequently remains in the hemiplegic cases, many develop entirely normally from this point of view; while in diplegia it is certain that a very large proportion of cases will never become normal mentally. It is, indeed, a fortunate thing that

convulsions, inanition, or some other cause, is prone to terminate early the lives of these little patients.

I should make one exception in the matter of unfavorable prognosis of diplegic cases, so far as the mental state is concerned. I refer to the condition known as "Little's disease." This word is sometimes applied in a way to cover all cases of cerebral spastic diplegia, but perhaps oftener to indicate only cases developing in prematurely born or imperfectly developed infants. Here it is not a hemorrhage or other lesion which is at fault, but simply a natural retardation in development especially of the pyramidal tracts, the child having been born too early. In these cases the symptoms are usually more paraplegic than diplegic, and we have good hope that eventually few symptoms will remain, and that the mind will not be much, if any, affected.

## ESSENTIAL HEMORRHAGIC PURPURA \*

By NATHAN E. BRILL, M.D.

Professor of Clinical Medicine, College of Physicians and Surgeons (Columbia University); Attending Physician to the First Medical Division of the Mount Sinai Hospital, New York City

---

THE subject which I am going to present is one of familiar aspect to the most of you as it represents a group of the hemorrhagic diseases known as purpura hemorrhagica, or more particularly morbus maculosus Werlhoffii, the macular or spotted disease of Werlhoff. I bring it to your attention because in the past its treatment could not influence the course nor dissipate the disease. When present in a patient all the physician could do was to attempt to check its accompanying active hemorrhages, an attempt in most instances futile; after which he would have to sit with folded hands looking upon the progressive march of the disease, most often to its fatal ending. I propose to show you this afternoon that the disease is now within our control and that it can be cured by surgical interference.

That there may be no confusion as to the type of the disease for which this therapeutic procedure is presented I want to preface its characters by the statement that we shall not deal with, nor is the operative procedure indicated in, the large class of those hemorrhagic diseases which occur secondary to other diseases and morbid processes, such as in the purpuras accompanying the exanthematic and some of the various infectious diseases such as smallpox and typhus fever, nor in the purpura due to specific bacteria such as pneumonia, epidemic cerebrospinal meningitis, nor in the purpura associated with arthritis such as peliosis rheumatica, nor that accompanying disturbed nutritive states like scurvy, nor accompanying endogenous poisons such as arise in the course of a chronic nephritis and of a carcinomatosis. Nor does it apply to the secondary hemorrhagic state accompanying certain forms of nervous disease like multiple sclerosis and hysteria, nor to certain so-called blood diseases such as

---

\* Based on Clinic delivered at Mount Sinai Hospital in honor of the members of the Tri-state District Association on April 20, 1923, and received for publication December 29, 1923.



pernicious anæmia and leukæmia, nor to disease of the hæmatopoietic system such as Banti's and Gaucher's disease, and so on and so on, in all of which purpura may be a symptom, nor in other conditions the results of metallic and other poisons, including toluylenediamine and snake venom.

The group for which the treatment is curative represents a definite one which has characteristic changes which can be demonstrated by an examination of the blood drawn from the veins or the capillaries and which has definite clinical manifestations. The latter are objectively the presence of a hemorrhagic eruption distributed over the entire body in isolated spots varying in size between a pin-head when they are called petechiæ, elongated linear hemorrhagic streaks produced by the trauma of rubbing or scratching the skin known as vibices, or large hemorrhagic areas called ecchymoses. All these spots represent an escape of capillary contained blood into the tissue of the skin. These spots may also appear on the mucous surfaces of the cheeks and palate.

Again there is bleeding from the gums which are spongy and the oozing is more or less continuous and covers the teeth with slimy blood-stained streaks, the lips and tongue with a brownish layer of disorganized hematin. The bleeding also takes place from the nose and escapes from both the anterior and posterior nares. Less frequently vomiting of blood occurs from the involvement of the gastric mucosa and the passage of tarry stools from the implication of the duodenal capillaries in this pathologic state. More rarely, though not uncommonly, is there a hæmaturia from renal implication.

From the loss of blood the patients become very weak and markedly anæmic and there develops a state of physical incapacity which makes them finally bed-ridden, especially the large numbers of cases in which the disease lasts a long time. Let me here interpose the statement that the disease occurs in an acute and also in a subacute and chronic form. As an acute disease it may spontaneously disappear after a course of ten days to three weeks or terminate fatally, as I have seen it in one instance, in twenty-four hours. When it attacks young people it usually goes into the subacute or chronic stage when the bleeding, or oozing of blood, may be continuous in small quantities for weeks. This type is known as subacute or chronic

continuous purpura hemorrhagica. Or the oozing of blood from the gums and the nasal hemorrhages may occur at intermittent periods with pauses lasting a few weeks when, reappearing with renewed vigor, they may extend over a period of many years until terminated by death. This is called chronic intermittent purpura hemorrhagica.

With this digression as to the course and duration of the disease let us return to its other objective clinical characters, and I shall present them by exhibiting this young girl, eighteen years of age, who came under my care in the First Medical Division of this hospital about three months ago with the history of having been suddenly seized with bleeding gums, bleeding from the nose and the rapid appearance of what she called "blood spots" over her body, appearing in large numbers and varying sizes. The bleeding and the development of the eruption were fairly continuous, particularly the latter, and there was rarely a day in which her skin did not show some fresh purpuric spots. She became so weak from the loss of blood which her physician could not check that she sought treatment at this hospital. I shall not take the time to go into the details of the anamnesis as we must hurry. Suffice it to say that there was no family history of any bleeding in any member of the family, no history of any infectious disease and no other data discovered which would indicate a secondary purpura.

Physical examination showed a very anæmic, robust-statured female whose body was covered with purpuric spots, oozing of blood from the gums and from the nares which were plugged with blood-soaked cotton which was dripping blood. Her blood-count showed a marked anæmia, 40 per cent. hemoglobin and 2,200,000 red blood-cells. We attempted to stop the bleeding with thrombokinase in vain. We did not give a transfusion because from our other experiences we know that transfusions either single or multiple are useless in this disease; in fact, whenever transfusions have been used by us in the past in this form of the disease, while a temporary stoppage in bleeding may have followed for a few hours, a larger amount of bleeding and an increase in the eruption occurred with renewed violence immediately after the short cessation. We have therefore given up transfusions as a remedial measure in this disease.

This girl was kept under observation for the purpose of determin-

ing whether this acute attack would spontaneously subside, as it occasionally does, or whether it would proceed into the chronic form of the disease. In a short time she developed an influenza, of which there was a sharp epidemic in the city at the time. Her infection was associated with a temperature of  $103^{\circ}$  F. and lasted five days. Toward the end of her infection her hemorrhagic condition ceased, the purpuric spots disappeared and we believed that she would furnish us with the third case which we have observed of acute purpura hemorrhagica which had been dissipated by the superimposition of an acute infectious disease. For three weeks she had no objective external sign of the disease, when quite suddenly the gums began to ooze blood again, nose bleeding supervened and a new purpuric crop of spots appeared on her skin.

As you see, the anæmia is definite. In the most of these cases it is profound and the skin of the patients is excessively white, almost of the same color tone as the sheets on which they lie. She has had vomiting of blood once; no melæna and no hæmaturia. The other characters of the disease are to be found by the examination of her blood and by physical tests to show the condition of the skin capillaries. You will notice that the patient's legs more particularly are covered with innumerable petechiæ, chiefly over the fibula side as far as the knee. This is due to the fact that she has been walking and standing and the increased pressure resulting from gravitation has caused the blood to escape through the capillary walls. I call this the capillary static test. It has been shown by Hess and others that in the purpuras when a tourniquet is applied to an extremity with pressure just sufficient to permit the blood to flow into the arteries of the limb, after three minutes, sometimes less, a crop of petechiæ appear in the skin below the constriction. Let us apply an elastic band to the arm of this girl. This having been done you will notice that on the flexor side of the forearm already, within two and a half minutes, petechiæ are appearing. Note that now those have appeared, here are some more. You may use the cup of a blood-pressure apparatus for this purpose and gauge the amount of pressure in millimetres necessary to bring out the petechiæ. Hess calls this test the capillary resistance test. It indicates one of the pathological features of this disease, namely, an abnormal vulnerability of the

capillaries. Normal individuals and normal capillaries never show this phenomenon.

One of the most important features presented by the blood in this disease, and which this patient shows, is the enormous diminution of blood-platelets. You know that the blood-platelets, otherwise known as thrombocytes, are essential cellular elements in the blood and vie with its other cellular elements, the red and white blood-cells, in importance. They are derived, according to the present conception of their origin as suggested by Wright, of Boston, and confirmed by Aschoff, of Freiburg, and others, from a detachment of the pseudopodia or parts of the bodies of the megakaryocytes of the bone-marrow. Normally, the thrombocytes or blood-platelets exist in the blood to the number of 150,000 to 300,000 in each cmm. On examining this patient's blood on her arrival, only 6000 per cmm. were found, and shortly after only 4000 per cmm. Bear in mind for the present that it is believed that it is the marked reduction of blood-platelets in the blood which causes hemorrhages from the capillaries. We will discuss later the relation of the blood-platelets to hemorrhages.

The reduction in the number of the thrombocytes induced E. Frank, of Berlin, to suggest the name of thrombopenic purpura for this disease. Eppinger, of Vienna, gave the more exact name of thrombocytopenic purpura which is the name by which it ought to be called because it better denotes this reduction.

Another noticeable change in the thrombocytes in this disease is found in their size; while they are few in number the most of them are two or more times larger than normal.

The blood-platelets may be reduced to as low as 50 per cmm. We have never seen a case in which they had entirely disappeared from the blood. This girl showed as low as 4000 per cmm.

On collecting some of this patient's blood and permitting it to clot in a test-tube, which it did in six minutes, the clot failed to retract which it always does when normal blood coagulum forms. This failure of the clot to retract constitutes another characteristic failure of the disease.

On pricking her ear lobe and permitting the blood to flow without interference we find that the blood-drops form and fall continuously and show a very sluggish tendency to stop. Twelve minutes are



consumed before her bleeding from such a prick ceases. This time is known as the bleeding time, which in normal individuals lasts from  $2\frac{1}{2}$  to 4 minutes. Duke, of California, was the first to call attention to the prolongation of the bleeding time in patients with this affection.

This disease may be here differentiated from the bleeding disease known as hæmophilia, which also is characterized by uncontrollable bleeding, by the fact that the latter is a familial hereditary disease, occurring in males, though transmitted by a female of a bleeding family. In hæmophilia there is marked *prolongation in the time for clotting* to take place, though when it does eventually form, clot retraction takes place. In purpura, on the other hand, the coagulation time is normal, the coagulum showing very defective properties to contract, shown by the marked prolongation of the time for clot retraction to take place.

Thus far the cause of this disease is unknown. Since her influenza attack we have kept this patient on the roof where she has lived and slept in the open, exposed to the sun and fresh air. It has not modified the course of her disease as you see she again shows the signs of active oozing from her gums and purpuric and ecchymotic spots on her body. A large proportion of patients with this disease have a large spleen. The spleen seems to be definitely enlarged in more than 50 per cent. of the cases. In this patient the spleen cannot be felt, though it may nevertheless be found subsequently to be enlarged.

Now, what shall we do for this girl to stop her bleeding and cure her disease? Before we discuss this, I shall ask to have the patient removed.

In the past this disease was a horrifying one because there was no means at our hands to cure the condition. At present there is a remedy, the results of which we shall show in two other patients to whom it has been applied with curative effects, *viz.*, the removal of the spleen.

This second patient, you see, is a stout, well-nourished, rosy individual, presenting a florid complexion and no signs of an anæmic state. When she came to us last October she was almost moribund from loss of blood which had been intermittent from nose, stomach and gums for fourteen years. Her disease started suddenly when she was five years old. She has been in a number of the large hospitals

in this city and Brooklyn during these years for treatment but she obtained no lasting benefit in any. During these hospital stays she had been transfused ten times, each time such transfusion having been done as a means of checking the bleeding, but all proved futile though they did serve as additional blood to a depleted supply.

When she was admitted to my service she was bleeding from her gums, she vomited blood twice, she had a continuous nose-bleeding and the surface of her body was profusely covered with purpuric spots and a number of ecchymoses. Her blood-count showed a hemoglobin of 28 per cent. and her red blood-cell count was 2,400,000. She was splenectomized in November. When the operation took place she was bleeding rather profusely from her nose which made great difficulty for the anæsthetist. The abdominal incision and wound were attended by profuse bleeding. In order to make good the anticipated loss of blood from this cause she had been transfused with 600 c.c. of blood (Unger method) the day before the operation. Blood oozed from the nose and abdominal wound during the entire operation up to the time that a clamp was placed on the pedicle of the spleen when all bleeding was checked and after the spleen was removed bleeding had ceased and the surgeon was able to sew up the incision as a dry wound. The result was remarkable and extraordinary. Since the operation there has been no return of the purpuric state, the patient as you now see her, six months after the operation, is rosy and apparently plethoric, her hemoglobin is 90 per cent., her red blood-count is 5,400,000 and she has gained sixteen pounds in weight.

The results in this case were as remarkable as were those in the case of Kaznelson's patient. Kaznelson was the first to put this operation into effect for this type of purpura.

I show you next this boy of sixteen years, who since he was eleven has had the same history practically as the girl just shown. Bleeding up to the point when his life was despaired of, transfusions seven times at various institutions, and on entrance into this hospital, bleeding from the nose, purpuric spots, a hopeless invalided state, bed-ridden, physically utterly incapacitated and as white as the bedspread on his bed.

Splenectomy advised by me was done on December 30, 1922, and the identical experience was met with in relation to the entire cessation of bleeding from the nose and the operated wound immediately on the removal of the spleen. This boy shortly after the operation had a short return of nose-bleeding and petechial spots on the legs. For the past three months all external signs of his disease have been absent. His blood examination now shows hemoglobin, 80 per cent.; red blood-cell count, 4,500,000, and he has gained twenty-two pounds.

With this experience we can conscientiously recommend as an apparently curative measure in the case of the first patient shown, a splenectomy which will be done next week.

We will conclude with a few remarks on the pathogenesis of the disease in the light of our experience with the last two cases which had been splenectomized. From them we learn that the conception of the nature of the disease as proposed by Frank, of Berlin, or as defined by Kaznelson, of Prague, will have to be modified.

It was believed by the first that the disease was a form of bone-marrow inhibition by which the megakaryocytic function in the production of platelets was interfered with; this inhibition he believed was initiated by the spleen. With deficient blood-platelets in the circulation the bleeding which accompanies the disease was a natural consequence. He proposed, therefore, purely on this theoretical ground, however, the removal of the spleen for purpura.

Kaznelson, in commenting on the fact that he found a large number of blood-platelets in the sinuses and lymph spaces of the spleen of a patient who had died from the disease, suggested that this disease was due to a perverted function of the spleen by which it rapidly removed from the circulation its contained blood-platelets. He believed if the spleen were removed that the blood-platelets formed in the bone-marrow would not be lost. He put this idea into execution and deserves great credit, though it appears now to us that his premise is not sustained as we will show.

It is true that after splenectomy the thrombocytes rise rapidly in number coincident with the increase in the white and red blood-cells. In the first splenectomized patient we demonstrated the blood-platelet count before the operation was 6000 per cmm.; immediately after the spleen was removed it rose and on the third day thereafter

reached 295,000 per cmm. This height was not sustained and it rapidly fell so that at the end of a week it was back again to 6000 per cmm. Likewise in the boy the thrombocytes before operation were as low as 400 per cmm., rose to 30,000, after operation, and ten days later were 6000; at present they are 20,000 per cmm. In both there exists at present a thrombocytopenia notwithstanding the absence of the spleen, whose removal was supposed by Frank, of Berlin, and Kaznelson to remedy the deficiency. Hence the spleen apparently does not inhibit their production in the bone-marrow, nor does it furnish the mechanism for their destruction. Possibly the spleen in this disease does affect the nature and agglutinative properties of the thrombocytes which interfere with their function in stopping the escape of blood from the capillaries. This is the present view of the mechanism of control of capillary hemorrhage. As we have shown, the number of blood-platelets in both the patients who were splenectomized is markedly diminished and has remained far below the normal during all these months; still no signs of bleeding have manifested themselves. We must, therefore, infer neither the number of platelets alone nor their quality alone determines the function of the capillaries to prevent the escape of their contents, but in the removal of the spleen, some factor was removed which interfered with this function. This may have been a toxic substance produced by a diseased spleen which destroyed or inhibited the function of the capillary endothelium to contract. This property of the endothelial cells of the capillaries has been revealed and demonstrated by Krogh, the Danish physiologist. Perhaps the spleen normally by a hormone or an internal secretion may control the normal tonicity of the capillaries while in disease this contractility may be diminished whereupon the platelets altered by a disturbed splenic influence may not exercise their added function in closing the stomata of the capillaries so as to prevent the escape of blood. These are inquiries with which we are at present occupied.

Finally, what I want to impress upon you is this, that Kaznelson opened the way to save the lives of these sufferers, that splenectomy is the only method of treating this disease, that it stops the hemorrhagic tendency and is above all a definite life-saving agency in essential thrombocytopenic purpura hemorrhagica.



# Symposium on the New-Born\*

- I. Problems of Prenatal, Natal and Neonatal Mortality.
- II. Injuries and Accidents in the New-born.
- III. Care of the New-born Child.
- IV. General Diseases Occurring in the Newly Born.
- V. Skin Affections of the New-born Baby.

---

## THE PROBLEMS OF PRENATAL, NATAL AND NEONATAL MORTALITY

By PRENTISS WILLSON, M.D.

Associate Professor of Obstetrics, Georgetown University,  
School of Medicine, Washington, D.C.

---

CURRENT literature is furnishing constantly increasing evidence of the interest being taken by various agencies, governmental, industrial, social, and philanthropic, in the saving of human life. It is rare, however, in such literature to find the proper biological conception of what human life really is. Life, biologically considered, begins with the fertilization of the ovum and inevitably ends with death. It makes little difference when it is terminated, whether in early fetal life or advanced old age, the result is the same and does not alter the fact that a new life came into being and for a varying period survived the hazards to which all life is exposed. It is proposed to define here human life as beginning with conception, not with birth, and to consider: First, the appalling loss of life occurring in the prenatal, natal and neonatal periods; second, the causes which operate to produce this loss; and, third, the extent to which it is susceptible of reduction.

The mortality of the neonatal period will be considered first because the available data are much more authentic and reliable for this period than for the natal and prenatal. The neonatal period will be arbitrarily considered as covering the first two weeks of life

---

\* Articles secured through the courtesy of John Foote, M.D.

because this is the average length of time during which the baby is under the care of the physician or midwife in attendance at labor. It is perfectly obvious, however, that prenatal and natal factors will continue to play an important part in the mortality of the whole first year.

#### THE FATAL FOURTEEN DAYS

In the year 1921, the birth-registration area of the United States covered 40.7 per cent. of the land area of the country, and had a population of 70,425,705, representing 63.3 per cent. of the total population. In this area there were reported 1,714,261 live births, a birth-rate of 24.3 per 1000 of the population. The infant mortality rate (number of deaths of infants under one year of age per 1000 live births) was 75.6. The mortality rate for the first fourteen days of life was 33.6. The rates for the first year from the following causes were as follows: Premature birth, 17.9; congenital malformation, 6.1; congenital debility, 4.4; injuries at birth, 4.2; and syphilis, .9. The total death-rate for these five groups was 33.5. It will thus be seen that whether we attempt to arrive at the infant mortality rate due to prenatal and natal factors by accepting practically all deaths in the first two weeks as so caused, or by taking the mortality rate definitely attributed by the reporting physician to such factors, the result is practically identical, namely, 33.5. Proceeding on this assumption, let us estimate for the population of the United States the annual loss of live-born infants from causes having their basis and origin in the prenatal and natal periods. In the year 1921, the population of the country as a whole was estimated to be 107,833,284. Applying the birth-rate of the birth-registration area, 24.3, to this population there should have been 2,620,348 live births. A mortality rate among these infants of 33.5 per 1000 live births from prenatal and natal causes would mean the loss of 87,781 babies.

#### OVER A HUNDRED THOUSAND STILL-BIRTHS

When it comes to estimating the loss of infant life attending birth itself anything like statistical accuracy is impossible. The first question to be answered is, what is the proportion of still-births to live births; and the second, what proportion of still-births is due

to natal instead of prenatal causes? The only extensive statistics on still-births are those of the birth-registration area (exclusive of Massachusetts, Rhode Island, Washington, and Baltimore, Maryland) for the year 1918. There were reported in this year a total of 48,634 such births. The still-birth rate per 100 live births, in legitimate births, was 3.9. For the white and colored races the rate was 3.7 and 7.5, respectively. In this connection it is interesting to note that in the state of Maryland exclusive of the city of Baltimore for the same year the rate was 8.6. This high rate was undoubtedly due to an intensive campaign conducted among the physicians to insure the reporting of all such births. This leads to the conclusion that if all still-births were reported, the true rate for the birth-registration area would be found to be appreciably higher than 3.9. In France 4.7 is the accepted rate. Cragin, at the Sloane Hospital, had a still-birth rate of 4.7 in 9769 births, premature and at term, but exclusive of abortions. In view of these figures it seems proper to accept the estimate of Bacon of a still-birth rate of 50 per 1000 live births for the United States as a whole as being eminently conservative. Applying this rate to the estimated number of births for the year 1921 we find the probable number of still-births to have been 131,000.

The question of the relative proportions of still-births due to prenatal and natal causes is difficult to answer. Bacon states that from one-half to three-fifths are due to natal causes. As yet no vital statistics are available showing the proportion of still-births due to different reported causes. Edgar in a study of the etiology of 500 still-births found 120 due to obstructed, precipitate or protracted labor, 65 to cord conditions and 47 due to placental pathology, *prævia*, premature separation, etc. In 149 cases the cause was unknown. It is probable that we will not be far from the truth if we assume that approximately one-half of all still-births are due to the accidents and complications of labor. If this be true it means the annual loss of about 65,500 infants from purely natal causes.

#### ABORTIONS ABOUT ONE-THIRD OF ALL BIRTHS

Since the term still-birth is defined as the birth after the seventh month of gestation of a child showing no single evidence of life after complete extrusion from the body of the mother, it becomes necessary

to consider now the loss of fetal life caused by the termination of pregnancy prior to the seventh month. At this point we find ourselves entirely in the realm of conjecture. Beitler quotes Pearson's essay on "The Chances of Death" to the effect that the fetal death-rate per 1000 live births amounts to 391 in the first three months, 131 in the second three months and 83 in the third three months of pregnancy, a total fetal mortality rate of 605. He also quotes Mall to the effect that the fetal death-rate is 500 per 1000 live births. Taussig estimates one abortion for every 2.3 pregnancies. I think we will be well within the facts if we accept the proportion that one pregnancy in three terminates in abortion prior to the period of viability, a fetal mortality rate of approximately 500 per 1000 live births from this cause. If correct, this means the annual loss for the United States of over 1,300,000 potential lives. Summarized, these figures indicate a mortality rate from prenatal, natal and neonatal causes of 583.5 per 1000 live births and an aggregate loss of life of over 1,400,000.

#### THE INDUCED AND CRIMINAL ABORTIONS

Turning now to the causes for this staggering loss of human life, staggering even if it be regarded as potential only, we must first consider the question of abortion. If it be true that there occur annually in the neighborhood of 1,300,000 abortions it becomes of more than passing interest to know what proportion of these are self-induced or the result of criminal interference. Taussig estimates that more than one-fourth of all abortions are induced. The truth in this matter is very difficult to arrive at. But if we cut Taussig's estimate in half we must still conclude that more than 162,000 fetuses are murdered annually. In any event the consensus seems to be that this crime is on the increase in all strata of society. The remedy hardly lies in the hands of the medical profession, the great bulk of whom scorn to soil their hands with the blood of these innocents. An intensive campaign, through the police power of the state, against the miscreants who engage in this nefarious business might have some beneficial effect—how much is dubious. The crime is too secret and, even when resulting in the death of the mother, too zealously guarded. That the solution will eventually be found



there can be no doubt, but one feels that it will lie in the ultimate evolution of the moral, social, and economic fabric of our civilization.

This is not the place to enter into any detailed discussion of the etiology of spontaneous abortion. Mall has pointed out that in many cases these are due to malformations of the ovum and in the present state of our knowledge regarding the causation of such conditions it is altogether desirable that such abortions should take place. In general it is undoubtedly true that the abortion rate will decrease with any marked increase in the general health and vigor of the population. The rate will also certainly decline proportionately with any decline in the morbidity rate from venereal disease. Any increase in the general level of obstetrical skill available for women at the time of labor, by insuring less traumatized and less infected reproductive organs, will necessarily mean a further decline. Anything like a general education of the prospective fathers and mothers of the race, frankly, openly and fully, in the physiology of sex, and the duties and the responsibility of marriage could not fail to have a beneficial effect. Education of the public, through the medical profession and lay journals, in the advantages and importance of prenatal care in early as well as late pregnancy and the increase of agencies to provide such care for the poor and uneducated would undoubtedly be helpful.

#### RESULTS OF SYPHILIS AND TOXÆMIA

We have assumed that the combined mortality rate from stillbirths and deaths in the neonatal period of the first two weeks amounts to about 83 per 1000 live births. For the purposes of the present discussion this mortality is divisible into two groups irrespective of whether death occurs *in utero*, during labor, or in the neonatal period. One group contains the deaths due to the accidents and traumatisms of labor, while the other embraces deaths from all other causes. It is true that it is difficult to draw a sharp line of demarcation between the two. Obviously factors tending to decrease the vigor of the child tend to make it succumb more readily to the dangers of labor itself, and conversely non-lethal traumatism during labor will lower resistance to the dangers surrounding the new-born or accentuate and intensify the effects of congenital debility carried over from the prenatal period.

Considering briefly the non-traumatic group we find the conditions more frequently responsible to be syphilis, toxæmia, prematurity, congenital malformation, and placental hemorrhage. One glance suffices to show the large degree to which a mortality from such causes is susceptible to marked improvement under intelligent and painstaking prenatal care. Early diagnosis of syphilis and toxæmia and their appropriate early treatment would, undoubtedly, markedly and favorably effect the number of premature births, both live and still, and the mortality of the early neonatal period. In the matter of malformation alone does adequate prenatal care hold out no hope of improvement. In this group a large number of deaths in all series of statistics is assigned to unknown causes, but there is no reason to believe that the future will not ultimately illuminate this darkness and furnish us ways and means of some prophylaxis.

#### BIRTH ACCIDENTS AND TRAUMA INCREASING?

There are some very interesting considerations to be discussed in connection with the group of cases due to birth accidents and traumatisms. We have seen that it is estimated that one-half of all still-births are due to natal causes, and there can be no doubt that such factors play an important rôle in the mortality of the neonatal period, probably a much more important rôle than would be indicated by the rate of 4.2 per 1000 live births furnished by the statistics of the birth-registration area for 1921. Bailey found that about 35 per cent. of the combined still-births and neonatal mortality at the Berwind Maternity Clinic were due to this cause, and in 705 still-births and neonatal deaths Williams found 17.6 per cent. due to dystochia. If, in this series, we add to these cases the deaths due to placenta prævia, ablatio placenta, cord infection, strangulation by loops of cord, and cerebral hemorrhage following spontaneous labor, the rate would become 24.3 per cent. Mary Lee Edwards' statistics showed a still-birth and neonatal loss of 215 cases in 3416 deliveries, and 43 per cent. of these were attributed to dystochia and the accidents of labor. It will thus be seen that it is impossible to overestimate the importance of labor itself in the causation of fetal and neonatal deaths. In this connection there is one very significant observation to be made. The rate for deaths of infants attributed to birth injury has been steadily climbing upward over

a considerable period of years. The vital statistics reports of the United States Census Bureau show a rate of 6.1 per 100,000 of population for 1906, 6.9 for 1910, 8.1 for 1913, and in 1921, the last year for which figures are available, 10.1, the deaths of 8986 infants having been returned as due to this cause. Is it not pertinent to ask ourselves the question: To what extent is the increasing tendency toward interference with labor, advocated all too frequently in high quarters, responsible for this increase?

#### A LIFE-SAVING EDUCATIONAL CAMPAIGN

It might be germane to call attention to the fact that this rate of 10.1 exceeds the total homicide rate for the same year, which was 8.5. It would seem to be only necessary to point out that these deaths can be very greatly reduced by the intelligent, conscientious, skilful and conservative conduct of labor, and by the provision of agencies to make services of this type increasingly available not only for the women of the poor but for women willing and able to pay a moderate fee for obstetrical services.

This brings us to the conclusion. We have seen that in the United States there is a probable annual loss of fetal life from abortion of 1,300,000, a very large proportion of which is criminal; 131,000 still-births; and 87,000 deaths of infants in the neonatal period from causes of a prenatal and natal character. Are these not astounding figures? Can anyone point out another field in which the combined labors of the clergy, physicians, lawyers, lay-teachers, medical educators and philanthropists of the country may result in so rich a harvest of innocent lives saved to the country and to posterity?

# INJURIES AND ACCIDENTS IN THE NEWLY BORN

By WILLIAM F. O'DONNELL, M.D.

Clinical Professor of Pædiatrics, Georgetown University; Pædiatrist to  
Providence Hospital, Washington, D.C.

---

HAVING in mind the fact that the primary aim of ideal obstetrics is the birth of a normal baby, a consideration of some of the injuries which may occur during its passage through the birth canal is of unquestionable importance.

## ASPHYXIA

The greatest danger which besets the baby on its way into the world is the interruption of its respiratory function. It is born usually with a degree of asphyxia or anærosis. Physiologically this is produced *in utero* by the rhythmical contractions of the uterus which retard slightly the maternal circulation through the placenta resulting in an increase of carbon dioxide and decrease of oxygen content of the fetal blood, while the resulting pressure of the advancing head on the floor of the pelvis slows the fetal pulse and accentuates the general lack of oxygen. After the baby is born two groups of asphyxia are recognized: The *livida* and the *pallida*. Until modern research has substituted accredited etiological information these older purely symptomatic titles will be used.

*Asphyxia livida* is characterized in brief by the dark blue appearance of the baby, swollen congested face, injected conjunctivæ, and deep blue lips, although the skin around the mouth may be pale. Tonus of the muscles is not lost, the arms are held up, the body fairly rigid, the throat reacts, and external stimulation produces a reflex. The heart and cord pulsate slowly and strongly. (This variety is found more frequently in vertex presentations.) Causes producing this form of asphyxia may be divided into (1) those which directly cut off the supply of oxygen and (2) those which cause compression of the brain. Among the former may be mentioned prolonged and hard labor pains which do not permit of sufficient aëration of the placental site; excessive retraction of the uterus from the body of the child with diminution of the placental site and varying degrees of



placental separation; low implantation of the placenta or placenta prævia permitting compression of a large portion of the placenta or of its cord between the presenting part and the pelvic wall; prolapse of the cord; wrapping of the cord around the neck and progressive grave constriction as the head advances either of the cord or the baby's carotids; rupture of the vessels in the placenta or velamentous vessels producing anæmia from hemorrhage; and deep narcosis of the mother. *After birth* the air passages may be blocked by a tight caul, aspiration of vaginal mucus, fæces, blood, meconium, or the mucus already present in the baby's mouth may be aspirated into the glottis. Œdema of the throat or glottis resulting from a face presentation may produce grave asphyxia.

In *asphyxia pallida* the clinical picture is entirely different. The child is pale and waxy, the lips alone being blue. The body is limp, the extremities are without tonus, jaw dropped, and throat does not react. No efforts at respiration excepting a weak occasional movement of the jaw. Pulse is weak and either very slow or rapid. Cord is limp and collapsed, the baby looking like a corpse. The absence of muscular tone and loss of reflex excitability are the criteria of this form of asphyxia. This is by far the more grave form and the more frequently followed by secondary asphyxia. *Asphyxia pallida* is the form usually following a difficult breech extraction. This is usually considered a more advanced stage of asphyxia. Crothers, however, offers another explanation of the *pallida* form. He fails to find any physiologic or clinical evidence to suggest that the pallor and collapse known as "white pallor" have the least connection with the supply of oxygen or carbon dioxide to the blood. Claiming that asphyxiated men never become pale and that experimentally no pallor occurs in asphyxiated animals he shows that exactly the signs present in "white babies" may be produced by disturbances of pressure near the medulla or by obliteration of the medullary circulation. By a careful study of the spine of new-born still babies he was able to show that the spine may be stretched two inches by a moderate amount of traction, that the lumbar cord is fixed so that the traction would pull the cervical enlargement downward about one-half inch. He reasons that traction in breech extractions by indirectly pulling the medulla lower into the foramen

magnum, aided by the suprapubic pressure on the after-coming head, almost inevitably impacts the medulla. That hemorrhage into the spine also plays an important part, although supposedly rare, is borne out by Stoltzenburg. She found in seventy-five cases of babies dying of asphyxia, nine cases of gross damage to the vertebral column, intervertebral ligaments ripped, and a profuse hemorrhage into and about the vertebral canal, covering the upper cord and medulla with clots. In all nine cases this finding was practically constant. An interesting point was that each of these babies had an extended arm which caused some difficulty in delivery. These facts suggested to Crothers that most of the breech babies born dead are killed by injury or pressure rather than by true asphyxia.

*Treatment.*—The treatment should be preventive as far as possible, by closely watching the progress of labor and the condition of the child in the first and second stages. Deliver the baby as rapidly as compatible with safety when the fetal pulse indicates circulatory disturbance, and discourage the routine of converting vertex presentations into breech for rapidity, or convenience of the attendant. In asphyxia livida the prognosis is good, primary respirations usually being automatic. After delivery it is important to clear the uppermost air passages before the child takes its first gasp. Apply external heat. Brisk slaps on the buttocks or feet may hasten, reflexly, delayed respiration. In pallida, Crothers belittles hot and cold baths, Schultze's manœuvre, etc. These *active* measures should be applied cautiously since in slight intracranial hemorrhage, which is often present, grave injury may result from vigorous manipulations. The logical treatments are those of shock and hemorrhage: (1) Warmth. (2) Lowering the head so that blood may be assisted by gravity to the brain. (3) Efforts to restore the stagnant blood in the splanchnic area by suitable abdominal binders. (4) Adequate artificial respirations. (5) Efforts to excite the medulla. Due to its pathology (medullary hemorrhage and impaction), the mortality of the pallida must necessarily be high.

#### INJURY TO THE BLOOD VASCULAR SYSTEM

Next in importance are injuries to the blood vascular system resulting in hemorrhage. The most important of these are the intracranial hemorrhages. In common with the other varieties of visceral

FIG. 1.



A persisting facial palsy. (Photograph by Dr. John Foote.)





hemorrhages, intracranial hemorrhages occur most frequently in large children and following difficult labors, but may occur in normal easy births due to pathological conditions present in the blood or their vessels. Evidences of hemorrhage in the abdomen are not uncommon, but for the most part consist of small hemorrhages on the surface of viscera covered by peritoneum. Large intraperitoneal hemorrhages are rare and are usually from the mesenteric arteries or from the suprarenals. The thorax protects the lungs well from injury so that hemorrhage into the lung is rare. When present the clot by blocking a bronchus produces a condition similar to atelectasis. The danger of intraspinal hemorrhage in breech extractions has been touched upon and occurs probably more frequently than one is led to suspect. Subcutaneous hemorrhages are usually present in the presenting part due to pressure of the pelvis or in forcep applications. The most frequent of these are about the face in face presentations, and in the cellular tissue of an extremity when same is prolapsed. In difficult vertex presentations we occasionally get an extravasation of blood under the pericranium due to rupture of some of the small vessels from pressure, the cephalhematomæ.

*Symptoms and Treatment.*—Small hemorrhages in the abdominal cavity give no symptoms and no treatment is indicated. The severe forms produce sudden collapse and death. Treatment is unavailing. Severe spinal hemorrhage usually produces death. Milder hemorrhage may produce no symptoms, or later evidences of paralysis, the exact distribution of which depends upon the part of cord involved. Subcutaneous hemorrhage and cephalhematoma tend to resolve and the application of heat and massage may facilitate absorption. The bleeding tendency and the influence of this on intracranial hemorrhage will be considered elsewhere.

#### INJURIES TO THE NERVOUS SYSTEM

Cerebral paralysis will be taken up later. Spinal paralysis is extremely rare as the most frequent site is in the cervical cord and produces death. Among peripheral nerve injuries the most frequent are those to the branches of the facial (Fig. 1), and either hemorrhage or avulsion of the cervical root, or pressure on the brachial plexus. Erb's paralysis is due to injury of the fifth or sixth motor root of

the brachial plexus usually by traction in delivering the after-coming head. Peripheral paralysis of the lower extremity is rare and is the result of some grave error in obstetrical judgment. These injuries are due to traction on presenting parts, as the arm and shoulder, or the after-coming head.

*Symptoms and Treatment.*—In general when the paralysis is due to hemorrhage the repair is slow but often complete. In complete section the prognosis is grave as to return of function unless the nerve ends be found and sutured. In facial paralysis, the injury is usually produced by the blade of the forceps close to the exit of the nerve from the stylohyoid foramen. The face is drawn to the opposite side, with inability to close the affected eye, and often difficulty in nursing. The prognosis is good. After several months the paralysis usually clears. In Erb's paralysis the arm is rotated inwards, the thumb pointing backward. Sensation is usually not interfered with, while the muscular atrophy is rapid.

#### FRACTURES AND OTHER INJURIES

*Osseous System.*—Fractures of the long bones and epiphyseal separation occur more frequently in breech extractions, particularly when the arms are permitted to extend. The clavicle in its outer third and the upper end of the humerus are the most frequent sites. In fractures of the clavicle the prognosis is very good unless there is an accompanying injury to the brachial plexus.

*Treatment.*—For fractures of the clavicle a pad in the axilla, and fixing the arm in a slightly raised position is all that is necessary. For fracture of humerus, a plaster cast is usually necessary. Fracture of spine often results in death. Fracture of the skull may occasionally be produced by pressure of forceps, or a spoon-shaped depression without fracture may be produced by an abnormally prominent sacrum. The treatment of such depressions is expectant.

*Other injuries* which may be mentioned are rupture of muscles, particularly the sternomastoid by forcible extension of the head, lacerations of the scalp, scrotum, rectum or vagina by mistaking the presenting part, laceration of an ear, injury or destruction of an eye, fracture or dislocation of the jaw, contusions of cheek or neck. Our newer knowledge of the frequency of occurrence and the influence

of the hemorrhagic tendency in complicating even minor injuries in the new-born should be kept strongly to the fore.

## REFERENCES

- Holt, "Diseases of Infancy and Childhood," New York, 1922.  
Williams, "Obstetrics," New York, 1920.  
De Lee, "Principles and Practice of Obstetrics," Philadelphia, 1918.  
Crothers, "The Effect of Breech Extraction upon the Central Nervous System of the Fœtus," *Med. Clin. N. Amer.*, May, 1922.  
Ehrenfest, "Birth Injuries of the Child," New York, 1922.

## CARE OF THE NEW-BORN CHILD

By JAMES M. MOSER, M.D.

Clinical Professor of Pædiatrics, Georgetown University; Director of  
Out-patient Clinic, Children's Hospital, Washington, D.C.

---

WHEN the last torturing pain accomplishes its purpose and the cord is tied the accoucheur, watching the infant borne away in a blanket, washes his hands and departs, breathing sighs of relief that his work is done. But it is in truth just begun: He has the responsibility of a new life upon his shoulders, a life whose future depends greatly upon the intelligence and skill of its attendants during the first few days and weeks after birth. This is the critical period of life and the one most lightly treated.

Immediate warmth after birth is absolutely essential and the physician should see to it that warm blankets and hot-water bottles are in readiness and properly placed. The temperature of the room should be kept between 80° and 85° F. for safety. The infant's body temperature should be taken at frequent intervals and maintained at proper levels (98° to 100°) by hot-water bottles if there is any tendency to the subnormal. Extreme precautions should be taken against sudden chilling and all unnecessary handling forbidden, especially of premature and delicate infants. In this connection a note of warning should be sounded against the practice of allowing young infants to be taken out of doors in the first few weeks of life, especially during cold weather. It is a safe rule to keep these babies indoors for one month during warm weather and two to three months during the winter season. And yet the writer has frequently seen half-frozen infants of several weeks of age out in freezing weather and has been told by the mother that her obstetrician advised her to do so. Surely the fresh-air craze can be overdone.

### RESUSCITATION

If measures for resuscitation become necessary they should be employed with caution and gentleness. In the milder forms of asphyxia simple flagellation, spanking, or the alternate use of hot



and cold baths will suffice in the majority of cases. In severe forms, however, these are ineffectual and more strenuous manœuvres are called for. In the writer's opinion Shultze's method of swinging the infant in the air is nothing short of barbarous and extremely dangerous and should not be employed in any case. The simple methods of Dew and Sylvester and Laborde are efficient and may be employed while the infant is kept continuously in the hot bath. Meltzer's method of the continuous insufflation of air is promising but hardly practical for routine use. As a last resort direct inflation of the lungs by the mouth-to-mouth method has saved many a life, though advised against by many authors. If a strip of sterile gauze is placed over the infant's mouth during the procedure and forceful breathing limited by the operator, the dangers may be minimized. The writer has frequently seen this method succeed where others have failed. The pulmotor for this purpose has been unsuccessful in the hands of most practitioners. Whatever method is used it is important that the mouth and pharynx be first cleaned out and that the first movement should be that of expiration in order to expel mucus and other foreign material from the passages. In cases where artificial respiration has been used particularly, and even as a routine in all cases, it is absolutely vital that the infant be made to cry sufficiently for proper lung expansion during the first few days. For this purpose the writer has found that the very simple method of flicking the soles of the feet with a rubber band will produce highly satisfactory results, and the nurse is instructed to perform this duty at frequent intervals.

#### PROPHYLAXIS

Immediately after birth the eyes should be cleansed with absorbent cotton and boric acid solution or boiled water, and then two or three drops of 10 per cent. solution of argyrol or a 2 per cent. solution of silver nitrate instilled into each eye. The silver nitrate should always be used where there is any suspicious vaginal discharge in the mother. These preparations should be *freshly* made for use and their application not repeated unless the eyes are infected. If used too freely or when too old a non-infective but persistent conjunctival irritation may be set up.

## THE BATH

The first bath should be given in a warm room, using water at a temperature of 100°. The body should be oiled thoroughly before the bath in order to remove the vernix caseosa. This should be very gently done to prevent dermatitis and abrasions which might permit the entrance of infection.

## THE UMBILICAL CORD

The cord should be dressed with a simple sterile dusting powder and wrapped in sterile gauze, after which a flannel band should be applied. At this time a thorough examination should be made for injuries received during delivery and note taken of the condition of circulation, respiration, etc. The child should then be placed in his crib in a quiet darkened room. The eyes must be carefully protected from strong light during early infancy. Too much stress cannot be laid upon the importance of keeping the child from being handled by relatives and friends. Many dangerous respiratory infections, etc., have in this way been unnecessarily contracted by the helpless infant. The "No Visitors" sign on the door of mother and infant for at least one month after birth will aid the successful outcome of many a difficult case.

The cord should be kept dry and undisturbed until it falls off. The striking frequency of umbilical hernia in babies points to some glaring and, as yet, undetected error in the present technic of caring for the cord. The routine use of a sterile gauze pad and supporting flannel binder for at least one month after the cord drops off is advisable and should be considered essential. There is too much of a spirit of derision among modern obstetricians regarding the use of this binder. While it is not necessary as a protection to the abdomen it is indispensable to the thorough healing of the umbilical wound when properly applied.

The foreskin of the male infant should be attended to by the physician himself and not left to the care of the nurse or mother during the first weeks of life. Many an unnecessary circumcision has had to be done in later months because of neglect of this matter by the attendant. Adhesions of the clitoris should also be broken up at an early date.

FIG. 1.



Malnutrition and atrophy in twins through lack of breast milk and improper feeding.  
(Photograph by Dr. John Foote.)





## BREAST MILK AND COLOSTRUM

Perhaps the most important single factor in the successful care of a new-born infant is maternal nursing. Year after year so many new facts have been brought out by laboratory workers and clinicians pointing toward the great advantages of breast milk over artificial foods that it has now become almost an unwritten law that no child should be deprived of its natural food except under most unusual circumstances. Human milk is now known to contain vitamins essential to the proper nutrition of the child. There is no doubt that it also contains immune bodies which protect the infant against certain diseases and strengthen its resistance against all infections. Those who do pædiatrics must have been struck by the remarkable immunity and freedom from serious sequelæ of the breast-milk babies as compared with the artificially fed infants during the recent epidemics of influenza and "grippe" ravaging this country. Even colostrum has come in for its share of study and praise. It is now believed that colostrum possesses a distinct bacteriolytic action, containing agglutinins which are directly absorbed into the blood of the new-born, thereby conferring upon it an acquired immunity. According to Boyd, the blood of the new-born before ingestion of any food contains relatively small amounts of globulin and negligible quantities of euglobulin. In infants receiving colostrum within a few hours after birth there is a marked and early rise in the total globulin content, while in infants deprived of colostrum the globulin content of the blood-serum remains low. These experiments and clinical observations emphasize anew the importance of colostrum in the nutrition of the new-born. Every effort should be made to have the infant nurse the mother for the first week, even if the milk supply itself cannot be stimulated. (Fig. 1.)

## FEEDING MANAGEMENT

For the first seventy-two hours the infant should receive two to three ounces of boiled water at four-hour intervals. I do not believe it of any advantage to add sugar to the water during the first days of life; on the contrary it may lead to digestive disturbances. Immediately before the water is given, the infant should be put to the breast and taught to nurse; even if it gets no milk for three days the colostrum may be plentiful. An infant requires one-sixth of its

body-weight in milk daily and until the milk becomes abundant the difference must be made up in other fluids. As has been stated before, the writer has never seen a case of inanition fever or physiological icterus in an infant receiving early and sufficient fluids.

For the average case, experience of various clinicians has shown that the three-hour interval for breast nursing and four-hour interval for artificial feeding has produced the best results. A study of each individual case will decide which is the best interval for that particular baby. The four-hour interval should not be established as a routine measure by hospitals. To follow it rigidly leads in many cases to loss of breast milk by insufficient stimulation, and to failure of a sluggish, lazy baby to take sufficient nourishment in twenty-four hours.

The baby should not be removed from the breast because of the results obtained on chemical analysis of the milk. After all, the infant himself and not the laboratory offers the supreme test as to whether or not the breast milk is of good quality. It is well known that the composition of milk, in all its constituents, varies greatly in the same individual, not only from day to day but also at different periods of the same nursing.

#### TOILET OF THE BREAST

It has become a recent fad in some lying-in hospitals to forbid any cleansing of the breasts or the baby's mouth by the nurse or mother. Just why there can be no middle ground in this matter is hard to conceive. There has no doubt been serious results attributable to rough washing of breasts before and after nursing but that should not prevent the moderate use of solutions to clean off caked milk and perspiration from breasts and nipples. The dictates of common-sense and cleanliness demand it. Neither can there be any danger resulting from gentle cleansing of stale milk curds from the baby's mouth once or twice a day.

#### THE MOTHER'S DIET

Too little attention is paid to the diet of the new-born baby's mother. For centuries our grandmothers have stoutly maintained that certain articles of food pass over in the milk and produce definite symptoms in the baby. Recently investigators have proved the same

thing in a more scientific way, which allows us to accept our grandmother's theory. Shannon finds that egg and veal protein may appear in the milk after their ingestion by nursing mothers. Strong clinical evidence is plentiful that colic, eczema, diarrhœa, milk crust and vomiting in breast-fed babies may be due to allergic food reaction of the infant to breast milk. The writer has frequently proved to his own satisfaction that the following articles of food eaten by a nursing mother have caused gastric disturbance in her infant, *viz.*, eggs, green corn, turnips, raw onions, rhubarb, strawberries, grape fruit, and cabbage. Some supervision of a nursing mother's diet should be deemed essential, at least in the earlier weeks of the infant's life. Later he will tolerate about any food ingested by the mother.

#### PREMATURITY AND ITS PROBLEM

The premature and exceedingly delicate infant requires very special skill. Under care given the average case these infants would survive but a few weeks at the most. Any child weighing under five pounds should be placed in this class.

The most important problems in the management of these cases are: First, to maintain the proper animal heat; second, to provide nourishment; and third, to prevent infection. Immediately after birth these infants should be well oiled and wrapped in cotton from head to foot, leaving only the face exposed. Instead of a diaper a pad of gauze and cotton may be made and slipped under the buttocks. He is then wrapped in blankets and placed in a basket with protected sides and containing hot-water bottles. It is extremely important that these infants be not handled; they must be carefully protected from draughts and sudden changes of temperature. No attempt should be made to bathe them, but the cotton may be changed and the skin freshly oiled every other day. Artificial heat may be provided simply with an electric pad. The room temperature should not fall below 85° F. The infant's temperature should be taken every two hours and continuously kept between 98° and 100° F. by artificial heat. It should be fed without being removed from the basket until it is able to take the breast.

Breast milk is absolutely essential in the feeding of these cases. If the infant's own mother cannot supply it, enough can generally be obtained from women in the neighborhood, or friends. It requires

at first but a few ounces for the infant's needs. Haste is such an important factor in these cases that it is unwise to delay even one day before giving nourishment, in order to get a Wassermann test, etc. It is the writer's custom to boil all breast milk obtained from other sources, thus making it safe for immediate use. These infants should receive at first equal parts of boiled breast milk and boiled water, the interval and quantity depending entirely on the age and weight. If the breast milk seems unusually rich it may be well at first to let it stand for several hours and skim off some of the cream. Some stronger infants will suck from the bottle, but the majority must be fed with a Breck feeder, or medicine dropper, or even by gavage. From one-half to two ounces should be given slowly every one to three hours. As the infant gains in strength the dilution is gradually decreased and the amount at each feeding increased until nourishment can be taken directly from the breast.

While the artificial feeding of these infants is almost a hopeless task the writer has obtained very good results with several substitutes for breast milk and recommends them in the following order (always bearing in mind that "One baby's food is another baby's poison"): Dried milk-powder mixtures, fat-free whey mixtures, modified goat's milk formulas, and cow's modified skimmed-milk formulas.



## GENERAL DISEASES OCCURRING IN THE NEWLY BORN

By JOHN A. FOOTE, M.D.

Professor of Pædiatrics, Georgetown University; Visiting  
Pædiatrist, Children's Hospital, Washington, D.C.

---

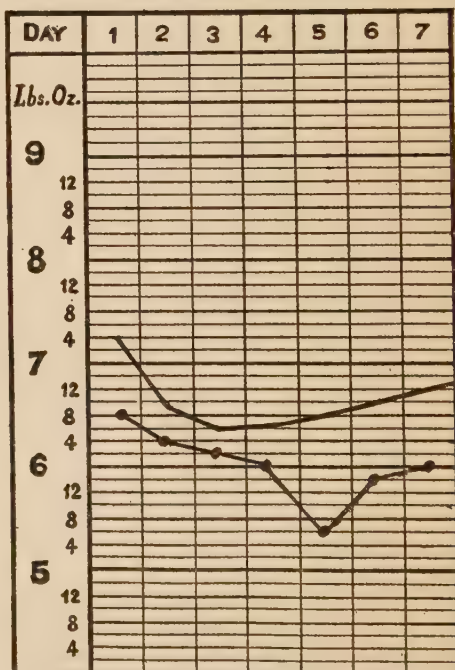
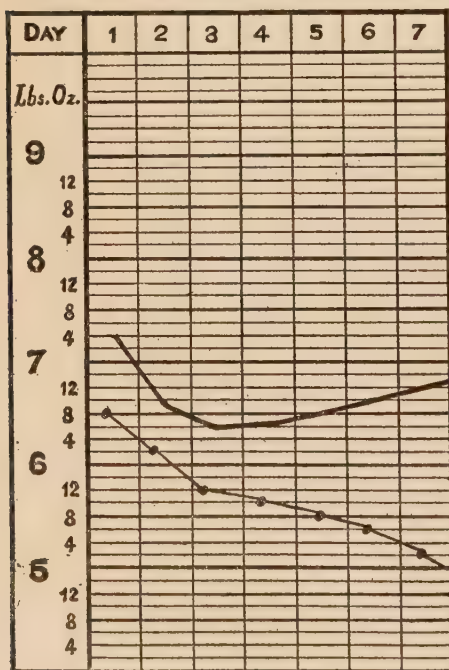
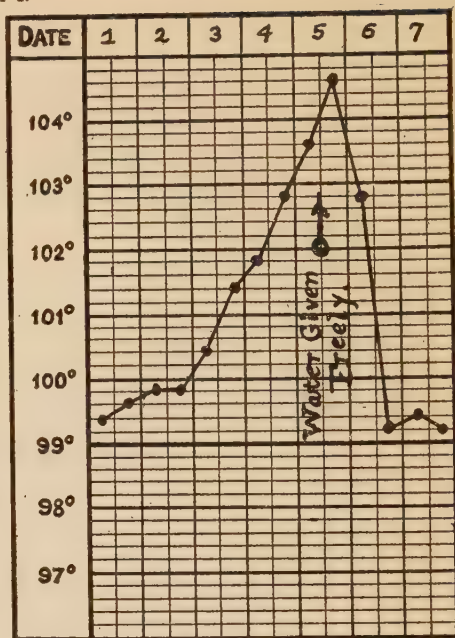
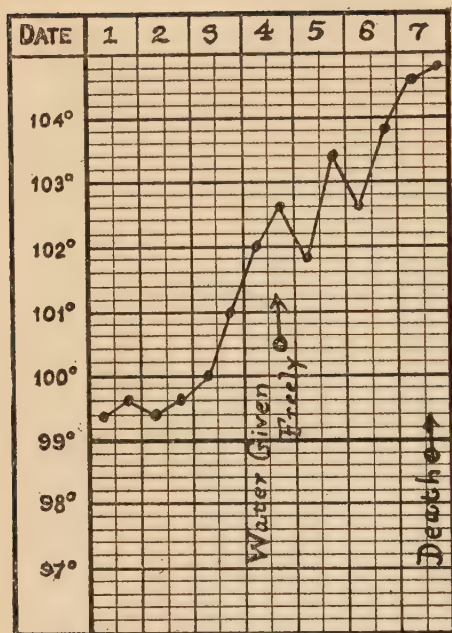
THE first few days of the infant's life in the world are marked by a tendency to a deep sleep which in some respects simulates anæsthesia. A temperature of about 100° F. by rectum is not unusual in the first twenty-four hours after birth. Sometimes after the second day of life rather high temperatures occur, amounting to 103° or 104° F. and ascending to this height usually on the fourth day. With such pyrexias the infant's skin and mucous membranes are parched and dry; he is restless at first and cries, but becomes more somnolent as the temperature rises. He has perhaps been placed at the mother's breast, but does not nurse well. This condition occurs more frequently with the first lactation than with succeeding ones. It is commonly found when the infant has this fever, that the mother's breasts are engorged and the extraction of milk is not an easy matter.

### INANITION FEVER

This febrile condition was named by Holt inanition fever, and has variously been attributed to lack of fluid, transitory sepsis, intestinal auto-intoxication, and many other causes. Lack of fluid undoubtedly plays a part in its etiology, though probably not the sole part. Theobald Smith's recent researches in animal husbandry, proving the bacteriolytic action of colostrum, would tend to show that when the child has not nursed a sufficient amount, colonization of bacteria in the lower bowel may occur to an excessive degree. That is probably one reason why the fever abates as soon as a good milk flow has been established and sufficient fluid has been given. The colostrum may possibly destroy the bacteria which were growing so rapidly in the previously inert meconium, or it may at least neutralize their toxins.

The foregoing is the most common type of fever which occurs in the new-born child. Alarming high temperatures are not uncommon in this condition.

CHART I.



Pneumonia of New-born

Inanition Fever

Temperature and weight charts contrasted in pneumonia of the new-born and inanition fever. The critical drop of temperature in inanition fever is shown after fluid has been freely given.

The critical

The prognosis is good provided proper treatment is instituted without delay. Unfortunately, a not infrequent and usually fatal disease, pneumonia of the new-born, resembles inanition fever in its symptoms to such an extent that it is almost impossible to differentiate these two maladies at first. Pneumonia of the new-born frequently proves fatal to the infant before any discernible physical signs are manifest. Cyanosis is usually found in the later stages of pneumonia, and is not present in inanition fever unless the latter is accompanied by cerebral hemorrhage or a badly compensated heart lesion. Any febrile condition in the infants occurring in the first few days of life which persists after sufficient fluid has been administered should be given at least a guarded prognosis. (Chart I.)

Treatment should be directed toward:

(1) Facilitating emptying of the mother's breasts by aspiration or expression of the milk *without breast massage* (since the turgidity of the breast is frequently due to congestion of the gland with blood, and not to distension with milk).

(2) Giving the infant small quantities of half-strength salt solution by rectum every three hours.

(3) Giving measured quantities of boiled water by mouth every three hours, together with expressed colostrum.

(4) Putting the infant to the mother's breast at three-hour intervals.

Within twelve hours of this treatment the temperature usually drops by crisis.

#### THE HEMORRHAGIC TENDENCY AND INTRACRANIAL HEMORRHAGE

Another condition which usually manifests itself within the first week of life, is the hemorrhagic tendency, with or without intracranial hemorrhage. In rapid labor, or in breech delivery, mechanical injuries to the small veins issuing from the superior longitudinal sinus, or from the vessels of the tentorium cerebelli, may cause either small or large extravasations of blood. In marked asphyxia, even without much trauma, small vessels may be ruptured. But when the larger vessels are torn, very rapid and fulminating symptoms such as blueness, rigidity and convulsions arise, followed by death in a short time. When small vessels are ruptured these symptoms

come on quite insidiously, and are frequently not recognized as characteristic of intracranial hemorrhage. Indeed atelectasis, congenital heart disease and other conditions are frequently thought of, rather than the real condition.

#### ARE ALL NEW-BORNS POTENTIAL BLEEDERS?

Another factor also comes into play which may, after three or four days, convert an otherwise negligible leakage of capillary-like vessels into a prolonged oozing with ultimate causation of intermittent asphyxical blueness and spasmodic symptoms. This factor is the so-called hemorrhagic tendency which all infants possess to a greater or lesser degree during the first days of life. Autopsies have shown that many infants had intracranial hemorrhage at birth with no symptoms of any kind during life to call attention to it; and Lucas and his co-workers have established the fact of a certain degree of delayed coagulability of the blood in almost all infants during the first week of life. When this tendency of delayed coagulation is extreme, symptoms of hemorrhage arise which may be manifested by a symptomatic complex involving the central nervous system, or by signs of oozing from any or all of the membranes which line the orifices of the body. Thus bleeding from the rectum, from the mouth, or from the nose or ears, or bloody vomitus, and especially oozing from the stump of the umbilicus may suddenly appear. But if any trauma has occurred to the small cerebral vessels, brain symptoms precede the local signs and may dominate the clinical picture, and may or may not be followed by hemorrhages from the mucous surfaces.

#### THE SYMPTOMS OF INTRACRANIAL OOZING

The infant with a hemorrhagic oozing within the skull does not usually nurse well, sometimes cries a wailing cry, and ultimately tends to a recurrently rhythmical cyanosis. Tonic movements of an arm or leg come later. The fontanelle is usually moderately tense. The lungs seem to be (and really are at regular intervals) almost atelectatic at the bases. The attacks of blueness pass away and the infant breathes properly and is quiet, only to become blue again after a short time and to resume his tonic movements. The blueness is always more marked, and appears earlier, in subtentorial hemorrhage.



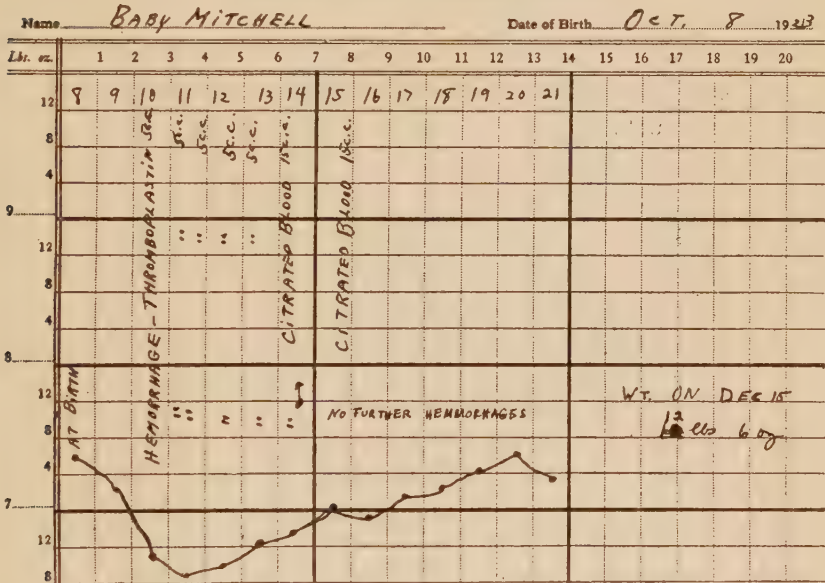
Lumbar puncture may reveal clear, or slightly tinged, or very bloody, spinal fluid, dependent on the duration of the attack and the location of the bleeding. It should also be remembered that accidental contamination of the spinal fluid with blood may easily occur in the performance of lumbar puncture on the very young.

## THE TREATMENT OF HEMORRHAGIC DISEASE

The treatment of hemorrhagic disease of the brain consists in (1) absolute quiet for the infant, abstinence from the effort of nursing or the ritual of bathing and dressing; (2) feeding with

## CHART II.

### INFANT'S DAILY WEIGHT CHART



The intraperitoneal injection of human blood in spontaneous hemorrhage. This infant showed varying amounts of fresh and clotted blood in the stools beginning thirty-six hours after birth and continuing for four days in spite of small, and probably inadequate, doses of thromboplastin. No hemorrhages occurred after intraperitoneal injection of citrated blood. This is one of a series of six cases, with one fatality, due to late treatment.

expressed or aspirated breast milk with a Breck feeder; (3) the injection under the skin or into the fontanelle of coagulative substances. The injection of 10 c.c. of citrated blood from the parent into the superior longitudinal sinus by way of the fontanelle is very satisfactory. The use of 10 to 20 c.c. of liquid thromboplastin subcutaneously is also advisable when human blood is not available.

Whole blood may be injected subcutaneously; but the writer has recently used successfully citrated blood, or whole blood diluted with normal salt solution, by intraperitoneal injection after the method of Siperstein. Only one fatality occurred in this series, and this was shown by autopsy to have been due to late treatment, and possibly an insufficient amount of blood relative to the large primary blood loss. (Chart II.)

The treatment of spontaneous hemorrhage from the other parts of the body is essentially the same. The injections, or transfusions, should be repeated every eight hours till the bleeding is controlled.

The writer has during the past five years treated over two dozen cases of intracranial hemorrhage by the foregoing methods, with a mortality of 40 per cent. Of three of the advanced and seemingly hopeless cases that I have been able to follow, two at the age of three are perfectly normal and one, aged four, has a slight spasticity of the right foot.

#### POSSIBLE ERRORS IN COAGULATION TESTS

The use of coagulation tests in the diagnosis of this condition has not proved as effective in the hands of clinicians as among the laboratory workers. The variations of error are too numerous, probably because of differing personal equations among workers in following the technic. Any method involving a stab wound in the new-born may produce an excess of thrombin, through the cell injury involved. The ordinarily used capillary-tube method is of no value. The aspiration of blood through the fontanelle with a fine syringe and using 2 c.c. in a cylindrical tube is believed to be an accurate method, but it is not suitable for general use. A simple estimation of the time required for blood to coagulate when a skin wound is made is probably as reliable a test as any method for clinical use. This method advocated by Duke consists in making a stab-wound in the heel and then, without squeezing, wiping away the exuded blood gently with blotting paper until bleeding has ceased. Normal, new-born infants have a bleeding time of not over three to four minutes.

#### JAUNDICE OF THE NEW-BORN AND LATE HEMORRHAGES

Jaundice of the new-born is almost a physiological condition. It usually clears up within the first couple weeks of life. Jaundice

persisting after the first month may be due to a congenital narrowing or occlusion of the bile-ducts. Persistent jaundice accompanied by high fever characterizes certain forms of sepsis accompanying umbilical infection. The use of calomel in the new-born to cure jaundice is worse than a therapeutic anachronism—it is very near to malpractice. Usually at this time the stump of the umbilicus will show an inflammatory reaction, though deep thrombi may cause sepsis with little external evidence, and indeed sometimes with little accompanying fever.

Since infection increases the amount of antithrombin in the blood, late hemorrhages either of the brain or the mucous surfaces may occur as a result of sepsis. The treatment is purely symptomatic.

#### PYLOROSPASM AND PYLORIC STENOSIS

Pylorospasm or pyloric stenosis is a disease of the latter part of the first month of life. George Armstrong's classical case, the first in the literature, to which I called attention in 1918, occurred in an infant aged three weeks. Nearly always the symptoms appear within the first month. Robust breast-fed infants are frequently affected. Persistent forcible and projectile vomiting, a visible peristaltic tumor travelling toward the duodenum, and scanty stools, often of a starvation type, characterize this condition. It usually comes on suddenly. Some cases can be controlled by stomach-washing, feeding with thick cereal gruels and the use of atropine internally. Most cases, however, are best treated by the operation of pyloroplasty. It is important not to postpone operation until the mother's breast secretion has dried up, or until the infant has lost much more than 10 per cent. of his weight. Watchful after-care including the use of breast-milk in rapidly increasing doses is essential to the attainment of successful results.

So many, indeed, are the ills to which the new-born infant is subject, that only a few can even be considered here. During the hazardous first month 105,000 infants die annually in the United States—over 8 per cent. of the total born. No field, therefore, in preventive medicine offers greater opportunity for beneficent progress than the study of the prevention of mortality in the first month of infant life.

# SKIN AFFECTIONS OF THE NEW-BORN BABY

By F. J. EICHENLAUB, M.D.

Associate Professor of Dermatology, Georgetown University;

Associate Professor of Dermatology, Howard University

---

WHEN one starts out to consider this question, one is confronted with the problem of separating the affections seen in the first few weeks of life from those that occur later. This is a rather difficult procedure, as the exact age of onset of many of the babies' affections are not set forth in the textbooks. I shall therefore have to depend largely on personal observations as to the diseases coming within the limits of the subject.

## CONGENITAL MALFORMATIONS OF THE SKIN

Of the strictly congenital malformations of the skin one must consider (1) ichthyosis, (2) epidermolysis bullosa, and (3) congenital hypertrichosis. The first of these is seen in the early weeks of life only when very severe, and in the cases the skin is thick, dry, cracking at the joints, and shedding scales constantly. This is the so-called harlequin foetus, and the baby rarely survives. In the type considered by Bowen<sup>1</sup> as "example of the persistence of the epitrichial layers which has usually been cast off by the seventh fetal month, but in these instances maintained its integrity to the time of birth, when it enveloped the infant like a membrane. After a short time this membrane peels off in large masses and sheets, leaving the normal skin below in a state of moderate desquamation." The condition is not serious, however. At times this condition may occur in linear arrangement over a limited area, causing linear naevus of the keratotic type. Treatment for the generalized condition is simply to keep the skin greased and clean. (Fig. 1.)

(2) Epidermolysis bullosa is due, probably, to congenital absence of elastic tissue in the true skin, so that on injury the skin responds with the formation of bullæ, which heal with flat, superficial scars. In most cases it is manifested later in childhood. There is no treatment except care in avoiding friction and injury to the skin.

(3) Congenital hypertrichosis are the hairy men and women

---

<sup>1</sup> Bowen, *Jour. Cutaneous Dis.*, 1895, xiii, 485.



FIG. 1.



Ichthyosis ("harlequin foetus").



of our circus side-shows. The downy hair often present at birth persists and becomes long and coarse, instead of shedding. There is no treatment.

#### TWO COMMON DISEASES

Two very common diseases seen in infancy are miliaria, or prickly heat, and intertrigo. Miliaria may be macular, papular, or vesicular, but a combination of closely set bright red discrete papules, with occasional vesiculation, and considerable inflammatory aveola is commonest. In the vast majority of cases it is a preventable disease, due to excessive perspiration from overclothing. In very hot summer it may be unavoidable, however. The infants should be so dressed that they do not perspire, and a light dusting powder freely applied. Soap should not be used in bathing, which should be performed with warm normal salt solution. Intertrigo is an acute catarrhal inflammation of the skin usually in the diaper region of infants, and caused by lack of care in keeping the baby dry and clean. It may occur in the folds of the neck, under the arms, etc., as a result of irritation from perspiration. The treatment is along the same lines as that of miliaria.

#### STREPTOCOCCIC INFECTIONS

The diseases due to the infection of the skin are much the most serious and important group to be considered, because they often result fatally to the patient. They require extreme care in diagnosing and isolating, especially in institutions, as severe epidemics with high mortality may be caused.

The two skin diseases caused by streptococci both occur in the new-born. *Erysipelas* is an infection, fortunately rare, occurring at the umbilicus. It is presumably due to infection of the cord, and for the most part is preventable by aseptic technic. The disease sets in with a sharp rise of temperature and an intensely red, dusky, œdematous, sharply margined inflammation of the skin about the umbilicus. Vesicles and bullæ are more apt to occur in this than in the adult type. It is nearly always fatal, and has the same clinical course as the adult type. General supportive treatment is all that can be done. Of course, these cases should be instantly isolated.

*Impetigo contagiosa*, the other disease due to streptococcus infection primarily, is in older children and adults a matter of little

concern. (Figs. 2 and 3.) Ordinarily this disease is produced by a strain of streptococcus of very low virulence, and while one sometimes sees impetigo after erysipelas and other severe streptococcus inflammation, it is an exceedingly rare occurrence for the opposite to occur. In infants, however, and particularly in maternity hospitals and infant wards, this ordinarily benign disease becomes a matter of grave importance. In impetigo the primary vesicle is due to streptococcus, the crusted ulcer and subsequent course to secondary staphylococci. Two things may happen, therefore, (1) the infant himself may become the victim of the severe condition, *pemphigus neonatorum*. (2) Infection of other infants from the original focus may take the form of this dread disease. Early recognition and prompt treatment are therefore of vital importance. In the ordinary form the disease begins as an exceedingly superficial and thin-walled vesicle, which ruptures within a few hours and leaves an ulcer extending only to the rete, which is rapidly covered by the typical yellow, stuck-on crust. One seldom sees the vesicle stage, the crust being the typical lesion. In bullous impetigo, however, a form not uncommon in children, the lesions are small or large bullæ filled with pus and serum, and not rupturing for a day or two. For the sake of prognosis, this must be distinguished from the pemphigus neonatorum by the absence of exfoliation and of severe constitutional reaction.

The best treatment in this case is to remove each crust and open each vesicle, then paint all lesions and the immediate area about them with a 3 per cent. to 5 per cent. silver nitrate solution. This is followed by a dry dusting powder if the disease is extensive, and repetition of the procedure in new or active lesion once a day. A 1 per cent. or 2 per cent. yellow oxide of mercury ointment, or a 5 per cent. ammoniated mercury ointment may also be used after removing the crusts, but is not as efficient alone as with the silver nitrate treatment.

*Pemphigus neonatorum* is a bullous disease of the new-born caused by streptococcus or staphylococcus. It is a much more serious disease than *impetigo*, frequently resulting in death. The mortality in different epiderma varies from 10 to 50 per cent. There occur bullæ, macerated exfoliation, subnormal temperature, and death from marasmus, or a very slow recovery in favorable cases. General sup-



portive measures, careful feeding and dusting powder are the mainstays of treatment.

Application of the aseptic technic of the delivery room to the nursery will prevent the spread of these infections. They are most frequently spread by the hands of attendants or by direct or indirect contact with infected articles.

#### INFANTILE ECZEMA AND "MILK RASH"

Three conditions are commonly grouped under this heading, although each is really a distinct disease. First we may consider *infectious eczematoid dermatitis*, the so-called "milk rash." This, in infants, starts as an infection of imperfectly cleaned vernix caseosa in the scalp, and spreads over the face and body as an eczematous or impetigenous eruption. It has little relation to diet, and is apt to start earlier in infancy than true eczema. It presents a crusted, oozing scalp and vesicles, erythema and crusts on the face, with occasionally erythematous patches on the extremities. This disease is due to the staphylococcus and will clear up promptly, as a rule, with the use of antiseptic and stimulating ointments, of which one of the best is a 5 per cent. crude coal-tar in Lassar's paste.

True *eczema* does not as a rule begin until the second month or later, although occasionally it does begin earlier. The picture of red inflamed cheeks and vesicles here and there, with oozing and crusting in bad cases is familiar to everyone. Our present-day conception is that infantile eczema is a dietary disease, primarily due to a sensitization to foreign protein. The commonest are egg and cow milk, but various vegetables and meats may be the exciting cause. In breast-fed infants the protein passes through the mother. In any case the disease is greatly aggravated by faulty feedings, not enough water, and fat, carbohydrate, or starch indigestion. Treatment consists in correcting the diet, eliminating absolutely the protein at fault, when this is possible, and using locally the coal-tar ointment referred to or a 1 per cent. yellow oxide ointment.

Great comfort can be given these patients by the use of very small doses of unfiltered X-ray.

The third disease which is usually called infantile eczema is *seborrhæic dermatitis*. This is not infrequent in the new-born, and occurs as yellowish-red papules confluent for the most part, and

covered with more or less crust of greasy scales. The acute form is usually diagnosed as infantile eczema. The more sluggish forms markedly resemble the papular confluent syphilides sometimes seen in new-born children, and only the absence of other characteristics of syphilis will settle the diagnosis at times. The treatment consists in the use of a mild sulphur ointment, such as precipitated sulphur, gr. x; acid salicyl., gr. v; white petrolatum, oz. 1. All forms are readily amenable to treatment, but are prone to recur. A mild infection of the bottle bacillus with the staphylococcus is the immediate cause. Nævi are of many varieties, and are to be treated surgically, or by carbon dioxide snow, X-rays, radium, thermocautery, etc. (Figs. 4 and 5.)

#### SYPHILITIC ERUPTIONS IN THE NEW-BORN

In general the lesions of congenital syphilis seen in the early weeks of life do not differ from those in the adult. Cases of chancre acquired during passage through the birth canal, and usually occurring on the head, have been reported. Aside from these rare cases the children are born with congenital syphilis, in the stage corresponding to the secondary stage in the adult, *i.e.*, with a general dissemination of spirochetes throughout the body. Not all congenital syphilitics show skin symptoms early in life, or at any other time, by any means, so that the absence of a rash does not exclude the diagnosis. When a rash does occur, there are certain forms seen more commonly. First of all, scaling of the palms and soles with a diffuse redness, or general mild exfoliation is strongly suggestive, but not diagnostic. Vesicles and bullæ do occur in early congenital syphilis, but certainly are not common, as one might be led to believe. These lesions are not characteristic unless superimposed on papules, or occurring with them. The lesions must be distinguished from bullous impetigo and pemphigus neonatorum. From the former the diagnosis may be made by the absence of any other signs of syphilis; from the latter by the local beginning, gradual progress, marked exfoliation, and severe course, as well as other signs of syphilis being absent.

The eruptions one usually sees are macules, usually relatively large, dark red, and scattered over the body! Maculo-papules, a pink, generalized, non-scaly, and generally discrete eruptions as to indi-

FIG. 2.



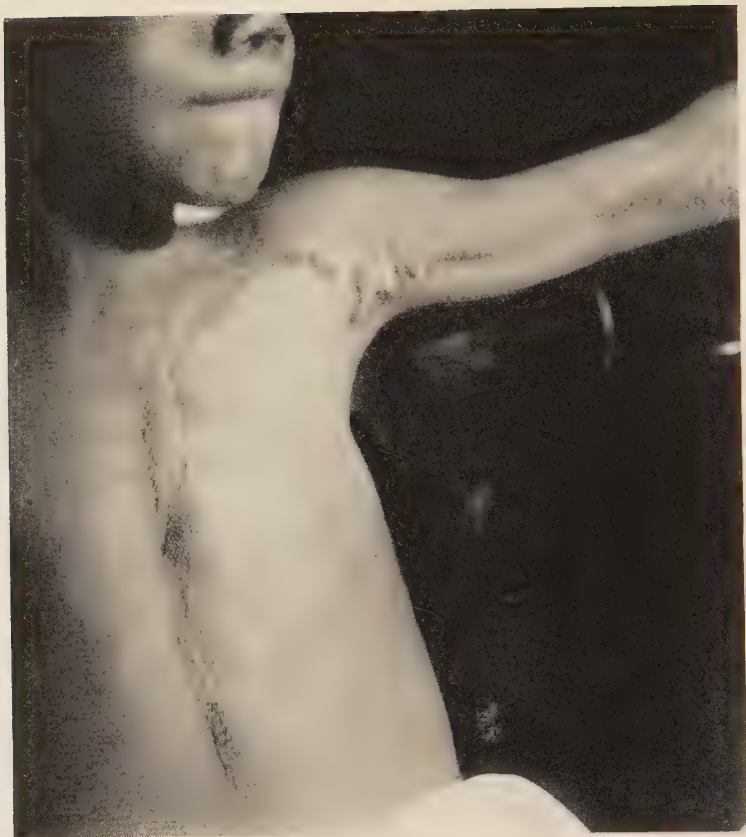
Impetigo contagiosa.

FIG. 3.



Bullous impetigo.

FIG. 4.



Linear nævus verrucosus.

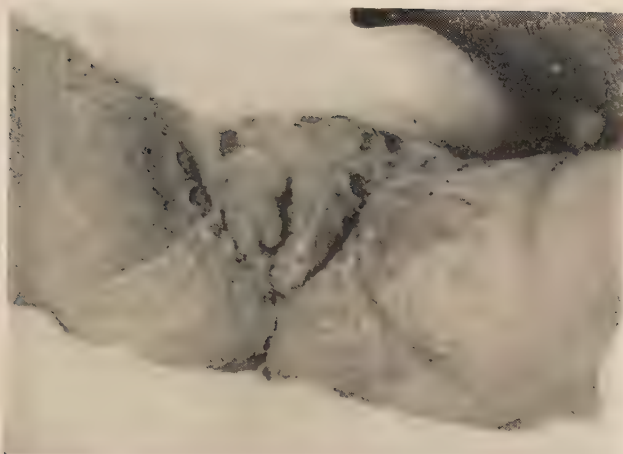
FIG. 5.



Linear nævus which was present at birth.



FIG. 6.



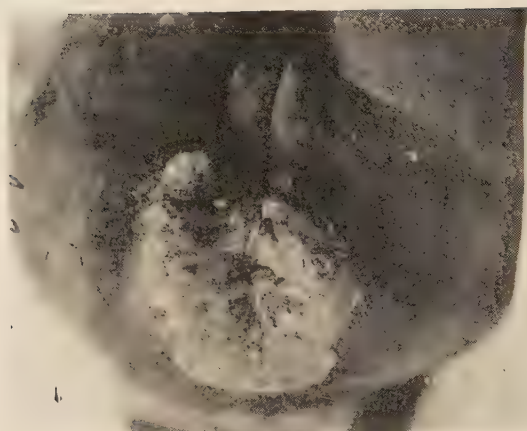
Condyloma in congenital syphilis.

FIG. 7.



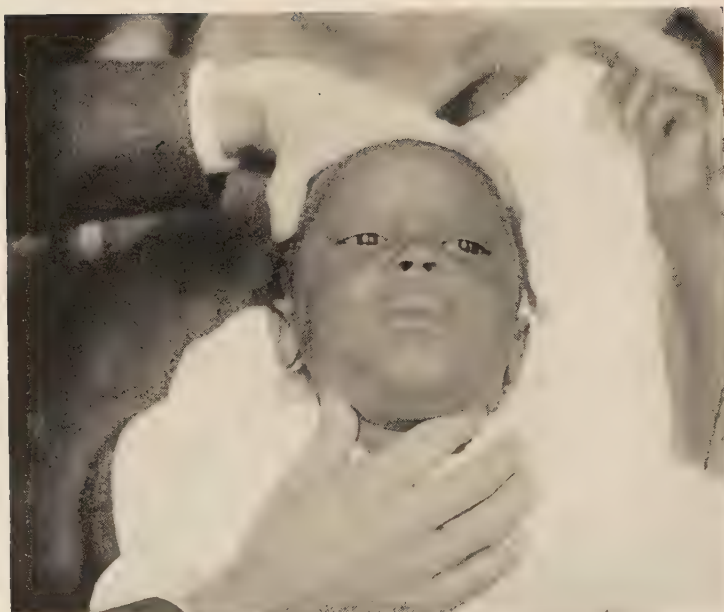
Congenital annular syphilis.

FIG. 8.



Condylomata.

FIG. 9.



Congenital syphilis around the mouth.

vidual lesions! True papules, sometimes lenticular, usually discoid, nearly always somewhat scaly, dark ham-red, indurated, and tending to be grouped, as a rule, on the face and in the diaper region, and finally true condylomata about the anus, vulva, and genitalia in general. In colored children the papules may be typically circinate. There is frequently an alopecia, especially marked where the hair is rubbed on the pillow. Mucous patches are common, and all the other signs of syphilis, or any combination of them, may occur. The Wassermann reaction is not reliable in the first three months of life, but its place is taken by the typical findings in the bones of the hands and feet on X-ray plates, showing osteochondritis of the long bones. (Figs. 6, 7, 8 and 9.)

*Treatment.*—It is my firm conviction that these cases should always be started on mercury therapy. Aside from this and the fact that treatment must be carried on intermittently over a period of at least three years, and observation continued to adult life, the problems are no materially different from those of acquired syphilis.

The illustrations accompanying this article have been taken from the extensive collection of photographs in the possession of Dr. H. H. Hazen, of Washington, D.C. My sincere thanks are due him for permission to make use of them here.

# Diagnosis and Treatment

---

## THE SURGICAL AND IRRADIATION TREATMENT OF BENIGN AND MALIGNANT GROWTHS OF THE UTERUS

By JOHN G. CLARK, M.D.

William Goodell Professor of Gynæcology,  
University of Pennsylvania, Philadelphia

---

### THE SURGICAL TREATMENT OF MYOMATA

AMERICA has set the pace for standardization of surgical procedures, largely through the interchange of ideas incident to attendance of the members of our various surgical guilds upon medical society meetings and to their frequent surgical pilgrimages to the larger clinics which to every up-to-date surgeon is a necessity if he is to be counted among the progressive group.

In speaking of hysteromyomectomy, it is quite unnecessary, therefore, to dwell upon the usual details of this operation but rather to draw attention to the technical points upon which there is still some divergency of opinion. Before considering the treatment of myomatous growths of the uterus, there are a few erroneous statements constantly coming to the surface, both in the surgical amphitheatre and in the medical societies of this country, which should be refuted. First, a small, symptomless myoma of the uterus is potentially of little or no evil, and it is not logical to subject any patient to an operation of even relatively small mortality until symptomatic indications arise. Secondly, myoma and fibroma uteri are benign, and so remain throughout their course except in the rarest instances. In over 1300 such specimens routinely studied in the Gynæcological Laboratory of the University Hospital less than 1 per cent. have shown sarcomatous degeneration. Thirdly, an occasional case, less than 3 per cent., is ultimately associated with cancer of the fundus, but there is practically always ample warning of the event, such as menorrhagia and particularly metrorrhagia, or the onset of excessive



malodorous leucorrhœa. Fourthly, in support of the assertion that sarcoma is of such rarity, in not one instance in this large series has sarcoma subsequently occurred in a cervical stump after a supravaginal hysterectomy.

The establishment of these scientifically certified premises renders it easy to base upon them a logical plan of treatment. In the first place a small, symptomless myoma may be kept under observation with complete confidence. In younger women it may not grow, whereas in women in the climacteric years it frequently diminishes or even disappears. The latter instance is one of those isolated facts which gave birth to that most pernicious adage of a generation ago, and which unfortunately is still of current usage—"Wait for the menopause and your bleeding will cease." In all popular sayings there is usually an element of truth, and this old professional slogan at least has some slight justification, but its dangers far over-ride its occasional safety. Frequently, we are consulted by patients who are the possessors of such benign and symptomless tumors who have been urged by some physician or surgeon to submit to an operation to avoid this phantom evil, sarcoma. This evidence in the face of well-established laboratory and clinical negations is fallacious, for no such sword of Damocles hangs over these women's heads, and by stressing this point the greatest apprehension is engendered in the patient's mind.

If one were to assume that the laboratory were at fault, this error would be revealed subsequently through the recurrence of sarcoma in a uterine stump left after a supravaginal hysterectomy. All too easily we fall into a too optimistic surgical mood, because the results of a simple hysterectomy are indeed almost free from mortality, but in the best of hands a fatal termination will occasionally occur from rare operative or post-operative sequellæ or other unusual lethal causes. Why take even this small risk when the tumor holds no secret or insidious menace which may outwit the surgeon if he is periodically keeping the patient under watchful consideration? While all myomata possess potentialities of evil, almost without exception ample symptomatic warning is given before the dangers are irremediable. Of course, the patient must be explicitly instructed as to premonitory danger signs; menorrhagia

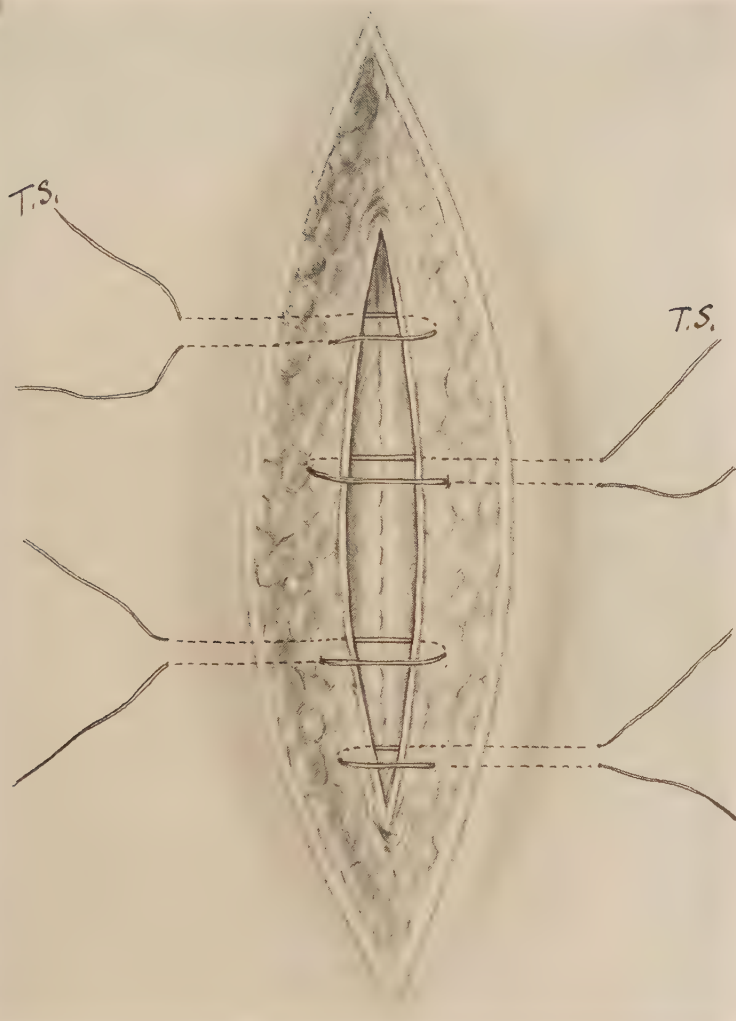
and, of even greater urgency, metrorrhagia; pressure symptoms, such as exhibited by disturbance of vesical and rectal functions; advent of pain, which may be due to changing position or character of the tumor, or to inflammatory pelvic symptoms, indicating the onset of morbid change in the appendages; excessive or malodorous leucorrhœa, which may mark the occasional coincidence of carcinoma of the fundus either ante- or post-climacteric.

*The Abdominal Wound.*—In all abdominal incisions the method of closure suggested by my associate, Doctor Keene, has served an excellent purpose.

In addition to asepsis, hemostases and overtension of sutures, there is still another factor in the healing of abdominal wounds of decided moment. In an otherwise satisfactory closure fat necrosis will occur in a small percentage of cases. This is usually noted several days after the operation and is characterized by the oozing of oily fluid from the wound. While the final integrity of the abdominal wall may in no way be prejudiced since the fascial union is not impaired, nevertheless, it will almost invariably slow the progress of convalescence and an early dismissal of the patient from the hospital. The usual cause of this complication is undue traumatism of the subcutaneous adipose layer either through rough retraction of the wound or from cross-hatching tension stitches. The method of closing the abdominal incision devised by my associate, Doctor Keene, completely sets aside this direct pressure and brings no force other than that necessary for snug approximation of the fatty tissues. The method of placing these sutures is depicted in the accompanying plates (Figs. 1 and 2).

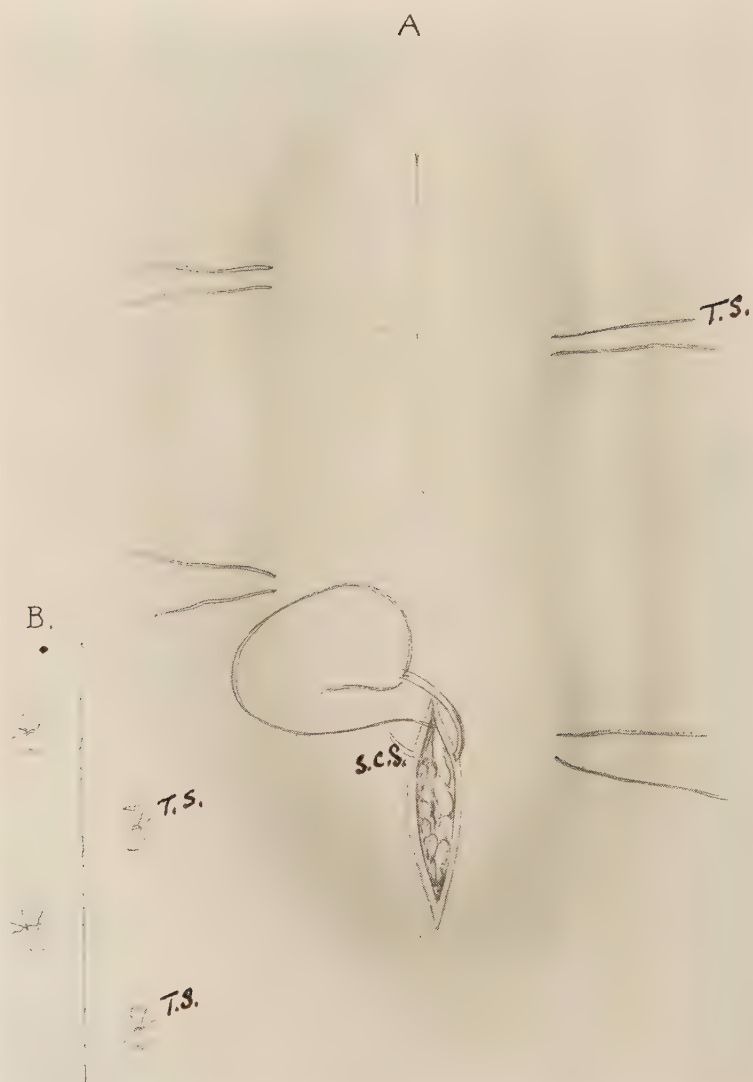
*Omaphobia.*—Finally, that symptom designated by Doctor Kelly as omaphobia may be the compelling motive at times for an operation in an otherwise symptomless case. Some women are so nervously constituted that regardless of the tact and reassurance with which the information relative to a benign growth is imparted to them, they instantly fall into a state of restless fear, which is dominated by a shuddering horror of cancer, and thenceforward brood over these possible dangers and absorb like a sponge the incredible gossip relative to cancer retailed to them by their inquisitive or meddling friends. When such a psychologic state is reached unquestionably

FIG. 1



The Keene suture perforates the skin at least one inch from the edge of the skin incision and passes down through the intervening adipose layer and rectus fascia without injuring the underlying muscle, thence transversely across the wound beneath the fascial layer to the opposite fascial edge, including at least one-half inch of this strong tissue. It then penetrates the fascia from below, upward and back to the opposite side underneath the fatty layer without touching the fascia and emerges about a half-inch from the point of entrance. These sutures are applied about one inch apart on opposite sides. Any plan of skin closure with suture or metal clips is applicable. Our preference is for the subcutaneous method. After the cutaneous closure is completed, the tension sutures are tied snugly but without undue tension over gauze bolsters, thus bringing the fatty layer into close approximation without direct pressure upon it. All dead space is thus obliterated. Should the wound at any time appear in hazard from infection, hot applications are made, and then a sharp pointed hæmostat may be passed down to the suspected area, and, if pus is present, evacuation is effected without the necessity of removing the tension sutures: A capital point in favor of the Keene method.

FIG. 2.



At the completion of the skin suture (A), the tension sutures, T.S., are tied over gauze bolsters, as depicted in the left-hand corner of the drawing (B).



the only way out is through an operation. For these patients, as will be noted later on, we always choose an operation with the possibility of conserving the ovaries rather than irradiation, which induces atrophic changes in these organs. Furthermore, a more or less dense fibroid at best slowly disappears after irradiation, and at times diminishes little or none; its mere presence, therefore, keeps these women in an endless state of alarm, and this is supplemented by the ill effects of a premature climacterium, especially likely to become exaggerated in neurotic women, whereas through surgical measures the tumor may be removed and the ovaries left intact, thus maintaining a potential element of endocrine value in such individuals.

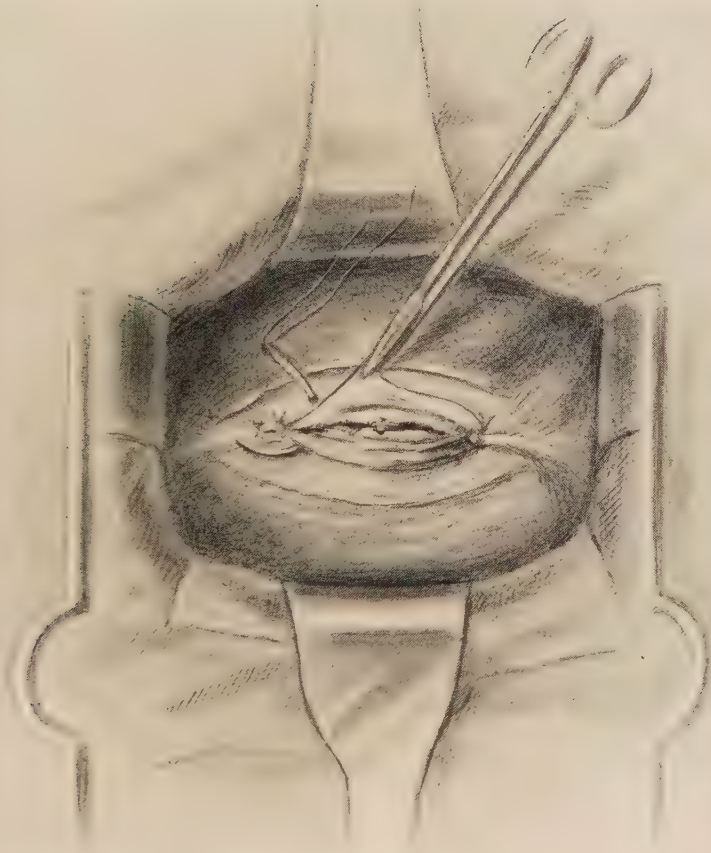
*Indications for and against Pan-hysterectomy and Supravaginal Hysterectomy.*—Some surgeons favor a pan-hysterectomy in all cases of myoma of the operable variety. What are the arguments offered in its favor? They are as follows: The danger of malignant changes in the cervical stump and the better convalescence of the patient so far as persisting or post-operative vaginal discharges are concerned. As to the first argument, we feel that it has amply been refuted. Concerning the second, the evidence in rebuttal is not so convincing, for there are instances in which there is an annoying and persistent leucorrhœa when the cervix is left. However, this sequel may largely be avoided by proper selection of cases. For instance, an hypertrophied or eroded cervix, or one which has caused an outpouring of leucorrhœa as a chronic symptom antedating the operation, is not a safe structure to leave behind, and a pan-hysterectomy is indicated. In the presence of these symptoms, a supravaginal hysterectomy would be an evidence of poor judgment, just as is a policy of total removal in all cases equally open to criticism. It has been argued by some clinicians that the more radical procedure is little or no more hazardous than the less extensive operation. It is only necessary to consider the small anatomic dangers in the latter as opposed to those of the former in order to realize that even in the hands of the expert operator there is inevitably a wide difference in the risks. As soon as the uterus has been removed by supravaginal hysterectomy, before proceeding with the further steps of the operation, the specimen should be opened into its cavity by a crucial incision, first longitudinally, then from cornu to cornu. Thus the entire mucosa may

be inspected, and through this routine macroscopic study, the dangers of leaving behind threatening tissue can almost surely be obviated. Next, as to the treatment of the stump. Formerly we cored out the cervical canal with a cautery, but this detail has been abandoned because burned tissue heals indifferently or even badly, subjecting the patient to the increased annoyance of post-operative vaginal discharge. With a scalpel or curved scissors, we now excise a cone-shaped wedge, including the cervical glands, at the same time so shaping the flaps that they may be approximated without undue tension. Overtension on sutures, which is always prejudicial to good healing, is especially bad here, for the cervical tissues are deprived of their chief vascular supply through the ligation of the uterine arteries. By this adherence to a sound surgical rule the objection to leaving a cervical stump may safely be discounted. In both supravaginal and pan-hysterectomy the round ligaments are invariably separately detached, and in the completion of the operation are dove-tailed into the cervical stump or vaginal cuff (Figs. 3 and 4). If these ligaments are atrophied or too short for this insertion without undue tension, this detail should be omitted, for more or less prolonged post-operative tension pain may be a sequel if this precaution is not heeded.

A further point well worthy of note in supravaginal hysterectomy concerns the preservation of the cervicovesical attachments and the fixed part of reflected vesical peritoneum. The point of amputation is made just above this area of fixation of the cervicovesical peritoneum, where it passes over from the cervix to the bladder. This still leaves a sufficient amount of loose vesical peritoneum to fully envelop the stump without limiting the distensibility of the bladder. The prime advantage of this point in technic is that should infection about the stump occur, this point of ligamentary fixation serves as an efficient barrier against a subvesical extension, because the point of least resistance is towards the cervical canal. When a pan-hysterectomy is performed, this anatomic barrier must of necessity be disrupted in order to remove the cervix (Fig. 5).

To summarize the clinical points which determine our choice between a supravaginal and a pan-hysterectomy they may be stated as follows: In a spinster or married woman with an intact or normal

FIG. 3.



In either a supravaginal hysterectomy or a pan-hysterectomy the round ligaments are secured in the cervical stump or vaginal cuff, thus giving stability to the pelvic tissues and the supporting upper part of the vagina.

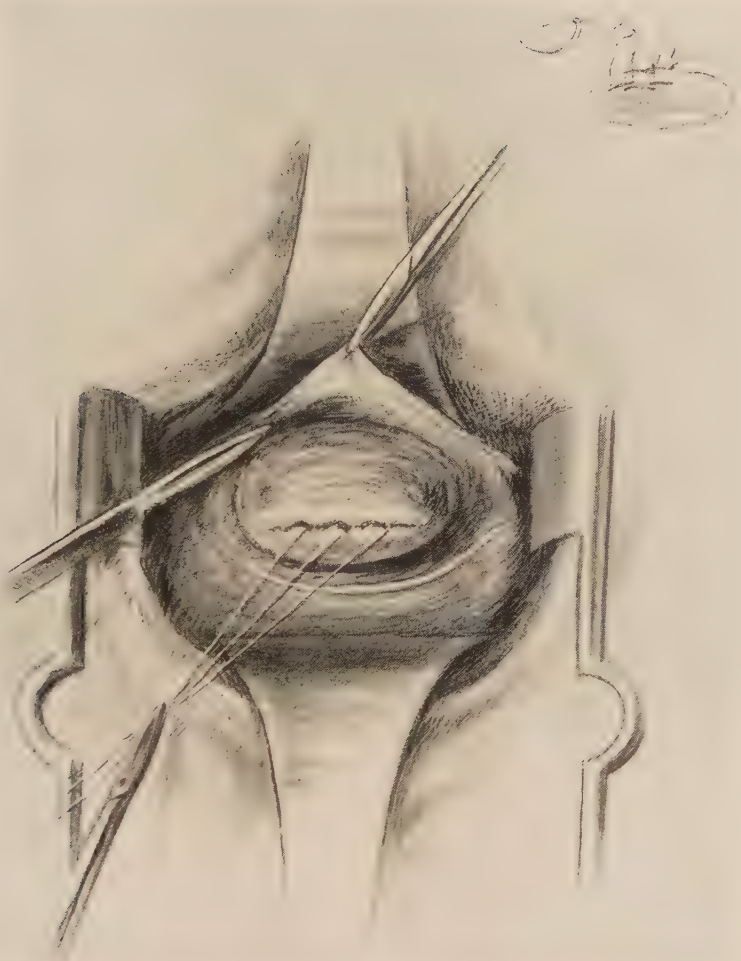
FIG. 4.



The peritoneal suture completed.



FIG. 5.



In a pan-hysterectomy for either cancer or myoma uteri a deviation is made from the usual technic of this operation followed in other clinics. After the uterine arteries are ligated, the uterus is amputated, as in all supravaginal operations. The cervix is first circumcised with the knife and then amputated with the cautery to avoid the danger of carrying infection or cancerous tissues into the parametrium. It is then closed by sutures left sufficiently long to serve as tractors. Through this step the bulk of the uterus is removed and the further dissection can be carried out more expeditiously and with less danger.



cervix, unless the tumor is of cervical origin, this portion of the uterus is invariably left unless the inspection of the interior of the uterus at the time of its removal shows a suspicion of malignancy. Such an issue is almost never encountered without a definite symptomatic forecast. On the other hand, when intermenstrual leucorrhœa has been an annoying or prominent symptom, or the cervix is lacerated and eroded, or is markedly hypertrophied, it is a preferable surgical measure to remove it. Nevertheless, the determination to take this greater hazard finally depends upon the patient's condition without heed for the remoter danger inherent in such a cervix. When the physical condition of the patient is poor, or she is very obese, or the cervix is more or less fixed or anchored in the pelvis, its extirpation is not good surgical practice, for many times there will be a post-operative shrinkage of the cervical tissues sufficient to cure the leucorrhœa. Should this symptom persist, it may subsequently be treated by Hunner cauterization, by irradiation, or more rarely, by the excision of the stump through the vaginal route. Therefore, in such instances as the foregoing, one should lay differential weight upon the patient's vital condition to withstand the effects of the more extensive operation rather than to expend the full measure of his surgical zeal in completing a more perfect theoretical operation.

#### THE TREATMENT OF UTERINE HEMORRHAGE OF BENIGN

##### ORIGIN BY IRRADIATION

Not infrequently clinical teachers of one-track minds dogmatically speak of surgical intervention *versus* irradiation. Such a biased presentation of this subject in the light of our present understanding of the merits of both plans of treatment has little or no logical basis, for no clinic dealing with these gynæcologic lesions can safely discard either method and remain abreast of progressive ideas, for both have vital stability, and any patient who is subjected to such a prejudiced opinion will not secure the most effective differential or selective treatment. There is no one so blind as he who has eyes but will not see. Intense partisanship in any medical issue is likely to lead one into the deepest clinical ruts.

We are now in a position to speak very definitely from a study of 527 cases of myomata and other benign lesions, causing atypical uterine hemorrhage, as to the efficiency of radium in the cure of this

symptom. This treatment is simple, it is almost devoid of danger, and in properly selected cases is absolutely curative through one application in over 90 per cent. of cases. For a full consideration of this study of cases we refer to our article, Clark and Keene, "Uterine Hemorrhage of Benign Origin Treated by Irradiation," in the *Journal of the American Medical Association*, for August 12, 1922.

*Technic of Applying Radium.*—The technic of application is very simple. Under nitrous oxide and oxygen anæsthesia, a careful pelvic examination is made. The size of the uterus is ascertained, and its depth is measured by a sound and recorded for future reference. A thorough curettage is performed, and the curettings are preserved for microscopic diagnosis. A 50-mg. tube of radium properly filtered is inserted to the fundus of the uterus. The duration of application depends largely on the age of the patient; in women at or near the menopause, the duration is usually twenty-four hours, and in young women proportionally less. A repetition of the application in young women is preferable to over-irradiation.

A point which we always emphasize in the use of radium in all cases of benign hemorrhages in women near or within the climacteric era is that one intra-uterine application of 50 mg. of radium for twenty-four hours suffices to cure the case effectively. We, therefore, strongly deprecate the repetition of these treatments, since each application carries a minimum danger with it, and has no merit whatever over one application which effectively cures in over 90 per cent. of cases. Also, we do not favor coincident röntgen-ray treatments, for they are quite unnecessary, and are usually a cause of great mental agitation to the patient.

The immediate symptoms attending irradiation are not unlike those of a simple curettage, with the exception that nausea is likely to be more persistent during the retention of the radium within the uterus. In all of this list, we have had no case of vomiting so persistent or prolonged as to give the slightest cause for anxiety. Usually, within one or two hours at most after the withdrawal of the radium, the nausea and vomiting cease. In a few instances, these symptoms have persisted for three days. As a rule, these patients remain in the hospital five days; for we follow the same rule here



that we observe in any case of simple curettage. It is unwise to permit the patient to go home the second day after irradiation, since the surgeon must see the patient through any possible danger arising from his surgical intervention, and such dangers are not past within twenty-four hours. As a rule, the patient sits up the third day and leaves the hospital the fifth day.

*After-treatment.*—The standing rule is for all of these patients to return for the examination at the end of from six weeks to two months after the treatment. If the patient lives at a distance and cannot return, a personal letter as to her condition is requested of the patient or of the attending physician. From our study of these final results, we conclude that a three-year period suffices for a complete observation. By no means do all tumors disappear, and a few do not diminish greatly in size; but as the majority of these cases have been treated solely for hemorrhages, with the cessation of this symptom the patient may be looked on as cured. After irradiation the great majority of tumors either shrink greatly in size or disappear completely. A subperitoneal tumor is not likely to be influenced greatly by irradiation.

The following clinical rules for guidance in the use of radium in myomata have been evolved from the study of this large series of cases:

*Contra-indications.*—(1) Tumors larger than the size of a four-months pregnant uterus, or those complicated by inflammatory lesions or neoplasms of the adnexa, should not be submitted to irradiation. Hysterectomy offers quicker relief for the first, and surgical intervention is imperatively indicated in the second class. In the exceptional case, larger tumors have been successfully irradiated in the face of some grave contra-indications to the major operation, and in others this treatment has been employed to check hemorrhage in seriously anæmic patients, thus permitting a sufficient recuperation to insure a safer operation.

(2) In tumors causing pressure symptoms, the shrinkage of the tumor is too slow after irradiation; therefore, hysterectomy is to be preferred.

(3) When in tumors there is cachexia out of proportion to the blood loss, this may be due to a necrosis of the tumor, which may be

hastened by the irradiation. We have observed several such instances. The recovery of the patient is very prompt and most satisfactory after hysterectomy, and it is, therefore, preferable (Frontis.).

(4) The large submucous tumors, and those so distorting the cervical canal and fundal cavity as to render the introduction of the radium capsule difficult or impossible, are not suitable for irradiation. A pyometrium may follow the application of radium in such cases. This sequel has followed in two instances.

(5) Tumors rapidly increasing in size or those which have undergone calcareous changes are not adapted to irradiation.

(6) Myomata in young women fall, as a rule, within the surgical domain, as a myomectomy or partial hysterectomy, which preservation of the ovarian function is decidedly preferable to irradiation.

(7) In patients suffering with an associated intraabdominal lesion, such as cholelithiasis, appendicitis, or gastric lesions of surgical consequence, it is injudicious to employ radium. In such instances, an exploratory incision should be made, thus giving a comprehensive diagnostic insight. The abdominal lesion may require first attention; but this does not preclude an irradiation at the same sitting, if the myoma or myopathic cause of the hemorrhage falls within the class to which this treatment is applicable. Under this plan of procedure, the treatment is fully subservient to the surgeon's judgment.

(8) In all cases associated with coincident inflammatory symptoms of the appendages.

*Indications for Irradiation.*—From a study of the foregoing contra-indications to irradiation, it appears at first glance that the field for its application must be a narrow one; and yet such is not the case. In 1921, 210 patients suffering with various types of benign uterine hemorrhages were admitted to the gynecological service of the University Hospital. Of these, 110 were submitted to irradiation and 100 to surgical intervention. Both classes of cases, under this careful segregation, yielded first-class results. Those undergoing an operation ran greater risks and were longer in the hospital; and the return to efficiency was much slower. But the ultimate outcome was entirely satisfactory, since these patients belonged without question to the surgical group.

We would commit a serious error were we to consider this splendid and most effective plan of treatment as a competitor of surgery. The two go hand in hand, and both must be supervised by the surgeon, and not by the röntgen-ray expert or the radiologist, for each in varying degrees is a surgical measure. As to the indications for this treatment, we may briefly summarize it in one sentence. "Irradiation is the treatment of choice for the smaller myomata in women approaching or within the menopausal years whose only symptom is hemorrhage."

#### TREATMENT OF CANCER OF THE CERVIX

Of all localities in the body, cancer of the cervix has been among the most unyielding to treatment, and in no situation has greater surgical effort been expended with such relatively poor results. For years gynecologists were in vigorous contention as to the comparative merits of the vaginal and the simple abdominal hysterectomy. As time began to reveal the results of these two methods both were found woefully deficient, and the paucity of cures viewed from the quinquennial standard turned the trend of opinion towards the more radical operation suggested by Ries, Runph, and myself, and later popularized by Wertheim through his extensive application of the principle and the perfection of its surgical details. My personal interest in this operation was engendered through the decided betterment in results following the application of the radical removal of the breast and its attendant axillary dissection, as suggested by Halsted. With great zeal, I championed the radical measure, and as time ultimately proved, the final statistics from the clinics of this country and Europe following its adoption were the best hitherto published, but the primary mortality was high in all hands and shockingly so in many. Then, too, the relatively low percentage of operability among the large number of cases passing under clinical review was tragically obvious, for the great majority reach a hopeless stage before they seek professional advice. Here that pernicious slogan, "Wait for the menopause and your bleeding will cease," works with tragic effect. Because of this dangerous procrastination an excellently conceived cancer campaign has been inaugurated, which has as its capital effort the instruction of the public concerning the danger signs of cancer in all parts of the body, and the necessity for

immediate medical consultation when these signals appear. This educational movement has been of great value as shown by the increasing ratio of operable cases applying to the clinics of this country, but still the tragic riddle remains and the key to its solution has not yet been found. The best results ever obtained from radical surgical measures in the Gynæcologic Clinic of the University Hospital by myself and associates totalled only 33 per cent. cures in a relatively small group culled from the hopeless cases. Since we have been interested in the use of radium as a therapeutic agent, we have estimated an operability of only one in five to ten cases of all those passing through the Gynæcologic Clinic. It goes without saying that no further progress is possible from still more radical surgical procedures, for the utmost anatomic limits have been reached. Indeed, for at least ten years we have abandoned the attempt to dissect out the iliac glands, for there is insufficient compensation against recurrence compared with its added dangers. From our present knowledge it may be stated as an axiom that metastasis to these glands means a fatal issue whether the glands are removed or not. The cures in cancer of the cervix in my opinion depend upon absence of metastasis, for our laboratory studies have demonstrated that in about 48 per cent. of operable cases of cancer of the cervix there is no lymphatic extension, and this percentage marks the high-water mark of curability. The extensive local removal of the invaded tissue with a healthy zone about it is, therefore, the real basis of cure. To accomplish this most effectively, a wide vaginal cuff and as much parametrium as possible should be excised with the cautery knife. Notwithstanding the paucity of results, the surgical removal of cancer in all parts of the body has yielded the only curative possibilities worth consideration up to the advent of the use of radium, and undoubtedly in its relationship to cancer as a whole, surgery still holds the most advanced lines of attack.

However, as to cancer of the cervix, there is now a growing belief, as the results of irradiation are appearing in our medical periodicals, that this newer remedy, which carries such small incidental dangers in comparison with the radical operation, may finally supersede it just as it superseded vaginal hysterectomy. In comparison with our



best efforts in the application of this radical measure which yielded only 33 per cent. of five-year cures, our first series of cases, which have passed the quinquennial test after irradiation, challenges most favorable comparison. Of 144 cases treated, there were 27½ per cent. of five-year survivors in the operable cases and 6.7 per cent. in the inoperable series, making in combination a slightly larger percentage than that yielded by our drastic surgical efforts.

In comparing these aspects of our statistical study, the ratio of cures from the two plans of treatment are found to be essentially equal. Back of this statement, however, there is much further meat for consideration, for the irradiation series was without a fatality incident to the treatment, whereas the mortality among our surgical cases was 8 per cent. Both with irradiation and the radical operation, urinary and other fistulæ will occur, but with the added precaution, which we now observe in protecting the adjacent tissues from over-irradiation, this danger has fallen to small proportions. From the standpoint of hospital economics and the subsequent efficiency of the patient, there are the widest possible differences. After a radical operation, the best, and frequently prolonged, nursing skill is required under the most auspicious circumstances. The patient is confined at least fourteen days in the hospital, and should post-operative complications arise, which are so common in these cases, her detention is more or less prolonged, and a return of ante-operative efficiency is slow. In other words, these are the difficult and expensive cases in our ward service. With irradiation cases, the picture in comparison is indeed a bright one, for the treatment is practically without primary mortality, three days in the hospital suffice for the first treatment, and the patient returns home and at once resumes her domestic affairs where she left off. Hemorrhage and discharge promptly cease in the vast majority of cases and in the curative cases there is an uninterrupted and quick return to health. Just as in our surgical experience, about 33 per cent. perish within six to nine months after treatment. From that time on, during the five-year period, they drop off in comparatively the same ratio. Those which pass the three-year limit without evidence of recurrence usually reach the relative safety limit of five years, although some die before and others even after this time. The big death toll, however, is

taken during the first two years subsequent to their discharge from the hospital.

While we are most favorably impressed with irradiation, nevertheless, as the question now stands, we realize that up to this date the curative goal for the great majority of cancer victims will not be reached through any means thus far discovered, but through this novel remedy, we have seen the horizon definitely widened and hope given to despairing women. With the ceaseless investigation as to the cause of this disease and the restless quest for the final remedy, one may take an optimistic outlook for the future, using to the best of one's ability the tools that are now at hand until this therapeutic millennium arrives. As to employment of the radical operation, we would take no issue with any skilled surgeon who has achieved the higher percentages of good results with the minimum percentage of operative fatalities. On the other hand, we believe that were this type of surgery abandoned, and all of these cases submitted to those surgeons and radiologists, who have given this treatment careful study and who possess enough radium to be really effective, that the sum total of results, both as to symptomatic relief and ultimate cures, would be decidedly in favor of irradiation. Much is being said to-day as to the value of deep X-ray treatment. This question is as yet decidedly in flux, and our skilled conservative röntgenologists are as yet hazarding no such optimistic statements as those issued from some of the German clinics. Our American röntgenologists are following the safe rule of making haste slowly. The conclusions of the staff of the Gynæcologic Department of the University Hospital upon the use of radium, after our study of 144 irradiation cases of cancer of the cervix that have passed the five-year limit, are as follows:

(1) Radium in 100-mg. amounts will yield most gratifying results if properly applied.

(2) To pursue a set course without variation in the frequency of treatment, regardless of the progress of the healing, is hazardous.

(3) To attain the best results, the first application should be done under nitrous oxide anæsthesia, because a more careful examination may be made, and the radium can more advantageously be brought in contact with the malignant areas, either through radium

tubes or by radium needles. Gauze packing instead of metal shields has proved of much greater value for protective purposes.

(4) The process of cure passes through three stages: Local destruction, connective tissue formation, and hyalinization.

(5) A hysterectomy after successful irradiation of an otherwise inoperable case is hazardous and does not promote the best interests of the patient.

(6) Results of irradiation in cancer of the cervix may remove this class of cases from the surgical field, although we have not yet completely yielded this point.

(7) Cases of cancer of the fundus, unless too far advanced, or unless there is a critical surgical contra-indication, should be submitted to hysterectomy, followed, from fourteen to twenty-one days later, by a light irradiation of the vaginal fornix.

(8) Massive irradiation is dangerous immediately before or after an operation, or when employed in fresh operative fields.

(9) Frequent repetitions of irradiation are probably unnecessary and possibly hazardous, as our observation points to the fact that the chief blow is struck at the first application. In no case that has required three successive treatments has there been a recovery.

(10) The frequency of irradiation fistulæ may be reduced to a minimum or almost completely avoided by the application of a well-placed vaginal pack, which pushes the healthy tissues away from the zone of intensive irradiation.

In closing, just one word of warning. Throughout this country, radium is being extensively purchased in small amounts on the assumption that a small dosage applied over a longer time will yield the same results as a more massive application. This is a grave error and no one should attempt to treat cancer of the cervix with less than 100 mg. of the radium salt. This point cannot be too strongly emphasized as will be brought out in the forthcoming report of the committee appointed by the American College of Surgeons to study the effects of irradiation in the treatment of cancer. A distinguished surgeon in speaking of this point said, "Too many fellows are spending a nickel for radium and doing a million dollars' worth of damage."

## HEPATIC CIRRHOSIS AND THE QUESTION OF THE OPERATIVE TREATMENT OF CHRONIC ASCITES

By F. PARKES WEBER, M.A., M.D., F.R.C.P.

Senior Physician, German Hospital, London, England

ALCOHOLIC cirrhosis of the liver is gradually becoming rarer. In many typical cases of chronic hepatic cirrhosis now met with in England there has certainly never been any abuse of alcohol, and I agree with those who think that the rôle of alcohol in the production of cirrhosis was formerly exaggerated. Doubtless an effect of alcohol on the hepatic cells is to diminish their resistance to microbic infections and to toxins derived from the alimentary canal; it probably acts in this way more in some individuals than in others. A condition resembling alcoholic cirrhosis in human beings has been produced experimentally in animals by chloroform or a similar agent combined with bacterial infection. W. G. MacCallum<sup>1</sup> lays stress on this, and also quotes experiments by Longcope, showing that lesions resembling those found in cirrhosis may be produced by repeated anaphylactic shocks caused by injections of egg-white or other protein—suggestive of an origin in some cases through protein sensitization and intoxication.

The actual cause of non-alcoholic ("idiopathic") hepatic cirrhosis, commencing in childhood or early adult life, and not connected with syphilis or tuberculosis, is not known. One may, however, suppose that the disease is the result of bacterial infection or of harmful substances absorbed from the alimentary canal, acting on hepatic parenchyma which is either congenitally or temporarily of low resistant power, and therefore predisposed to undergo degenerative changes leading to a reactionary—regenerative—cirrhosis. In typical cases of nodular cirrhosis of the liver two processes have been at work: (1) Attacks of acute necrosis of portions of the glandular parenchyma; and (2) interstitial fibrosis with nodular regenerative growth of glandular tissue. According to MacCallum,<sup>2</sup> "The bile-

<sup>1</sup> W. G. MacCallum, "Text-book of Pathology," second edition, 1920, p. 321.

<sup>2</sup> MacCallum, *op. cit.*, p. 328.



ducts which were interrupted by the death of the liver-cells send out sprouts which attempt to connect again with liver-cell strands. The masses of liver-cells quickly increase in size by multiplication of their cells, new capillaries are formed in every direction, and this labyrinth of cells expands, pressing the stroma away on all sides. For a time the liver-cells are normal, but then comes another injury, and many of the hyperplastic nodules are partly destroyed. The whole process is repeated, and not only once, but many times." The reason why the onset and step-like progress of ordinary nodular hepatic cirrhosis is often more or less latent is that the individual attacks of cell-degeneration, which thus follow one another, are not sufficient to give rise to symptoms of grave hepatic insufficiency. The reserve of functional power in the liver is normally very great, so that in animal experiments a great portion of the liver may be destroyed and in human beings a great portion of the liver may undergo acute degeneration without severe hepatic insufficiency resulting. During the intervals between the attacks, that is to say, during the non-active, "compensated" stages of hepatic cirrhosis, the results of tests for hepatic efficiency may fail to show anything abnormal and may therefore be misleading. The earlier individual attacks, or *steps in the progress of the disease*, are probably often only marked by such symptoms as malaise, slight jaundice, etc., which soon pass off.

Nevertheless, when during an attack the necrotic process is very extensive, amounting to acute or subacute hepatic atrophy, the symptoms may of course be much severer, of the *icterus gravis* type. Such an attack may soon terminate with increasing coma and death, or it may be more or less recovered from. MacCallum<sup>3</sup> mentions the case of a boy who had gone through a severe illness, which may have been acute yellow atrophy of the liver, six months before his death (from an infection). At the necropsy the liver was greatly reduced in size and showed extensive destruction of hepatic glandular tissue, but in the right lobe there was a tumor-like regenerative growth, of the size of a small orange, composed of dark-green lobules.

Through the kindness of my colleague, Dr. E. Schwarz, I recently had the opportunity of observing the case of a young woman (C. B.), aged twenty-eight years, who developed severe symptoms of the

---

<sup>3</sup> MacCallum, *op. cit.*, p. 320.

*icterus gravis* type. She gradually partially recovered, but developed ascites, which had to be repeatedly tapped, and also pleural effusion. She died about four months after the commencement of her illness. *Post mortem* her liver was found to weigh only thirty-six ounces and showed extreme destruction of the hepatic parenchyma. It consisted mainly of connective tissue, in which were scattered small nodules of yellow hepatic glandular substance. By microscopical examination the hepatic cells in these nodules were found to show regenerative changes; their nuclei stained well and many of them were multinuclear, some of them containing quite a large number of nuclei. According to H. M. Turnbull and R. Worthington<sup>4</sup> multinuclear hepatic cells, rare in normal livers, are conspicuous features in most regenerative nodules.

THE QUESTION OF OMENTOPEXY (BETTER "EPIPLOPEXY") IN CASES  
IN WHICH THERE IS CHRONIC ASCITES

When, owing to obstruction in the portal circulation, chronic ascites develops in cases of hepatic cirrhosis, it is exceedingly unusual to observe permanent disappearance of the ascites under treatment by repeated *paracentesis abdominis* without any operative interference of the omentopexy kind. When it does occur, it is probably due to the formation of omental adhesions and the gradual improvement of the collateral circulation, and, in cases associated with cardiac weakness, may be partly due to the use of cardiac stimulants and diuretics. In syphilitic cases success may be partly due to anti-syphilitic treatment.

Operative treatment of the omentopexy type has led to good results in various kinds of chronic ascites, notably in non-alcoholic ("idiopathic") cases of hepatic cirrhosis, but likewise in some supposed alcoholic cases, even when alcohol was not entirely abandoned, and in some cases with a positive Wassermann reaction in which antisymphilitic treatment was likewise employed. It is not likely to be attempted in extremely feeble, cachetic, and broken-down subjects.

One of the reasons why the operation has failed to become popular, even for selected cases, is that the good result is often greatly

---

<sup>4</sup>Turnbull and Worthington, "Archives of the Pathological Institute of the London Hospital," London, 1908, vol. 2, p. 48.

delayed, the patient often having after the omentopexy operation to undergo *paracentesis abdominis* many times before the final good result is obtained. In one case, to which I shall again allude, under my care the patient could not be readmitted to the hospital where the omentopexy had been performed and hopes of a cure of the chronic ascites as a result of the operation had been probably given up. Nevertheless, after some further tapplings the ascites diminished and then completely disappeared. In some cases an attempt at so-called "permanent" peritoneal drainage has finally led to cure of the ascites.

My attention was first drawn to the whole subject in question in 1898 by making a post-mortem examination<sup>5</sup> on a man, aged forty-four years, who had been, several years previously (in 1892), under treatment by Doctor Gee at St. Bartholomew's Hospital (London), where the diagnosis of cirrhosis of the liver with ascites was made. When the patient died, in 1898, the necropsy showed that he had really had cirrhosis of the liver, but that the *paracentesis abdominis* at St. Bartholomew's Hospital had been followed by the cure of the ascites and by the formation of extensive peritoneal adhesion. The man had evidently had chronic peritonitis in addition to his hepatic cirrhosis. In favor of the view that the peritoneal effusion, for which the patient was treated in 1892, was of an inflammatory nature was the relatively high specific gravity (1020) of the fluid first drawn off, and the patient's tendency at that time to have fever in the evening. I believe that a certain amount of chronic localized peritonitis, especially about the liver and spleen, is often present in cases of hepatic cirrhosis, and favors the development of peritoneal adhesions and new vascular channels, in the same way that a successful Talma-Morison operation (omentopexy, epiploexy) does. The chief *natural* collateral venous circulation in cases of hepatic cirrhosis is by the œsophageal veins, and a successful omentopexy operation ought to *assist nature*, by the formation of veins in the artificially produced omental adhesions, thus removing the necessity for *excessive* dilatation of the œsophageal veins, which would be likely later on to give rise to fatal hæmatemesis. In December, 1909,

---

<sup>5</sup> I reported the case in the *St. Bartholomew's Hosp. Rep.*, London, 1898 (vol. 39, p. 321), under the heading: "Cirrhosis of the Liver—Effect of Peritoneal Adhesion in Arresting the Symptoms of Hepatic Cirrhosis."

at the Clinical Section of the Royal Society of Medicine <sup>6</sup> I suggested that in regard to chronic ascites and the question of operative treatment beyond simple tapping, cases of hepatic cirrhosis might perhaps be roughly divided into the two following groups:

(A) Patients who for some reason (for instance, the presence of old perihepatitis and perisplenitis and extensive spontaneous omental adhesions) have the collateral venous circulation well established, and do not readily develop ascites but are, of course, liable to hæmatemesis from dilated œsophageal or gastric veins. The liver is generally decidedly enlarged in this group of cases.

(B) Patients with a poor collateral venous circulation, who develop ascites early. The main object of omentopexy and peritoneal drainage should be to convert patients of Class B into patients of Class A.

Up to January, 1912, together with my then surgical colleague, Dr. E. Michels, I had had four cases of chronic ascites, probably associated with cirrhosis of the liver, which were operated on (omentopexy or other methods) for the cure of the ascites.<sup>7</sup> The result was successful, but in none of the four cases was omentopexy by itself sufficient, and in one case the omentopexy was altogether omitted. Before the operation the general condition of all four patients was fairly favorable, but each case needed repeated *paracentesis abdominis*, so that there seemed to be no prospect of getting rid of the ascites without some kind of operative interference beyond mere tapping. In the case of a woman, aged forty-two years, whom I showed three years after the omentopexy, at the Clinical Section of the Royal Society of Medicine (London) on May 14, 1909,<sup>8</sup> peritoneal drainage—or rather, an attempt at continual peritoneal drainage (see further on)—was required to supplement the influence of the omentopexy operation before Doctor Michels succeeded in getting rid of the ascites. The same applied to the case of a woman, aged forty-nine years, whom I showed at the same society on December 10, 1909.<sup>9</sup> In both cases the good result followed Doctor Michels's peritoneal drainage

<sup>6</sup> *Proc. Roy. Soc. Med.*, Clinical Section, 1910, vol. 3, p. 80.

<sup>7</sup> I gave a short résumé of these four cases in *Proc. Roy. Soc. Med.*, Surgical Section, 1912, vol. 5, pp. 54–57.

<sup>8</sup> *Proc. Roy. Soc. Med.*, Clinical Section, London, 1909, vol. 2, p. 236.

<sup>9</sup> *Proc. Roy. Soc. Med.*, Clinical Section, London, 1910, vol. 3, p. 80.



rather than the omentopexy operation itself. In both cases the moderate pyrexia immediately preceding the final disappearance of the ascites was a noteworthy point.

In the case of a London barman, aged forty-four years, whom I showed at the same society on April 8, 1910,<sup>10</sup> omentopexy was given up because, when the abdomen was opened, the omentum was found quite small and could not be fastened to the abdominal wall; an attempt to fasten the spleen to the abdominal wall also failed, as it could not be brought down sufficiently. In that case the irritation due to the laparotomy was followed by irregular pyrexia and, after only one further *paracentesis abdominis*, by the cure of the ascites, in spite of the alcoholic element in the etiology; the patient's enlarged liver could still be felt, reaching down to the umbilical level.

The fourth case<sup>11</sup> was that of a woman, aged forty-six years, on whom in 1905, during the temporary absence of Doctor Michels, Mr. G. J. Jenkins performed the operation of omentopexy. *Paracentesis abdominis* was necessary after the operation, and one of the tapplings (by the house-physician at that time) was followed by intraperitoneal hemorrhage and grave collapse. Doctor Michels, who happened to be in the hospital at that time, opened the abdomen (chiefly under local anæsthesia), cleared out the blood-clots, and ligatured two omental vessels which he found bleeding. The patient, in spite of her collapsed condition (for which physiological saline solution and camphor oil were injected subcutaneously), recovered, and the ascites, though it temporarily returned, did not again need tapping, and was gradually absorbed. At one time some digitalis was given, and afterwards diuretin. In that case also a notable feature was the moderate evening pyrexia (up to 100° F. or slightly over) during the recovery, that is to say, during the period of final absorption of the ascites.

From these cases, and from what I heard and read of elsewhere, it seemed to me that an attempt at "continual" peritoneal drainage (in reality, in cases of chronic ascites the rubber tube or catheter used for the drainage tends soon to get blocked with fibrin and has to be removed), or some other kind of considerable peritoneal irritation,

<sup>10</sup> *Proc. Roy. Soc. Med.*, Clinical Section, London, 1910, vol. 3, p. 167.

<sup>11</sup> *Trans. Med. Soc. London*, 1907, vol. 30, p. 255.

was generally necessary, in addition to omentopexy, for the cure of the chronic ascites. In one of the above cases the irritation of the laparotomy, together with repeated *paracentesis abdominis*, sufficed without omentopexy. A febrile reaction, which might be of inflammatory origin or might be merely connected with the absorption of the ascitic fluid, accompanies the gradual disappearance of the ascites in some cases. In the rare cases which have been reported from time to time of rapid cure of the ascites following the operation of omentopexy it seems that the irritation of the peritoneum due to the operation is an essential factor in the immediately, or almost immediately, favorable result.

Since 1912 I have had to do with relatively few cases, at least of cases suitable for omentopexy. Occasionally the operation is fatal or unsatisfactory in its results. Moreover, *in some cases*, as in some of the above cases, the *exact nature of the cause of the chronic ascites is uncertain*.

In a man (C. C.), aged fifty-six years, a potman, with a history of having formerly drunk much alcohol, there was an umbilical hernia in addition to moderate ascites, an enlarged liver, slightly enlarged spleen and slight jaundice. On one occasion (February 18, 1913) there was slight hæmatemesis. Operative interference was decided on. Doctor Michels (March 14, 1913) opened the peritoneum and let out a moderate quantity of ascitic fluid. He could not feel any omentum and so contented himself with doing a "radical cure" on the umbilical hernia. At the operation he felt the liver as a hard mass. Immediately after the operation the patient vomited a little blood, but he did well, and the ascites appeared cured, at least there was no ascites (May 8, 1913) when I saw him last. It should, however, be noted that the ascites had not required paracentesis for about ten months before the operation. In fact, the fourth tapping had been at an infirmary in May, 1912, and after that, according to the history, the peritoneum did not commence to fill up again till the commencement of January, 1913. The ascites was only moderate and was not increasing at the time of the operation. The blood-serum (April, 1913) gave a doubtfully positive Wassermann reaction for syphilis; his wife had had two miscarriages and two children, who were said to be living and healthy.

In a woman (J. M. B.), aged forty-one years, admitted under my care in July, 1909, cure of chronic ascites followed repeated *paracentesis abdominis* and an exploratory laparotomy at which nothing special was found beyond the ascites. The last tapping was on November 11, 1909, when 3000 c.c. ascitic fluid were removed. On November 15, 1909, when she left the hospital, there was still moderate ascites. After that no further tapping was required, and when I saw her again on January 30, 1911, she looked remarkably well and there was no ascites. The liver could not be felt, but the spleen seemed to be enlarged and fixed by perisplenic adhesions to the abdominal parietes. Unfortunately, she had two hernias, an old umbilical one and one that had developed in the laparotomy scar.

In another one of my patients, Mrs. M. H., aged forty-seven years (1915), with chronic ascites and a large hard liver, where omentopexy had been thought of, disappearance of the ascites took place spontaneously after five abdominal tapings. There was an uncertain alcoholic history, and the Wassermann reaction was negative. This woman is now, February, 1924, in fairly good general condition, and free from ascites, though her liver is still large and hard.

A man (J. W.), aged forty-seven years, was admitted under my care, on January 28, 1915, with considerable ascites, moderate jaundice, and a history of previous alcoholism and probably also previous syphilis. There had been a suspicion of gall-stone colic not long before admission. His blood-serum gave a strongly positive Wassermann reaction for syphilis. The ascites disappeared (perhaps partly owing to treatment with potassium iodide). About two and one-half years later the patient died of cancer of the tongue, and the necropsy showed typical hob-nail cirrhosis of the liver, a gall-bladder full of gall-stones, extensive peritoneal adhesions rich in blood-vessels, and no ascites. No operation of the omentopexy class could have produced a better collateral circulation than nature did in this case.

I may here mention that in the case of a man (J. M.), aged fifty-nine years, in 1912, during an abdominal operation for some other purpose, the liver was found to show coarse hob-nail cirrhosis, and Doctor Michels performed a precautionary omentopexy to pre-

vent the occurrence of ascites. However, I lost sight of the case about seven months after the operation.

A very interesting case was the following one, partly under my care but mainly under the care of my colleague, Dr. E. Schwarz, whose kind permission I have to refer to it. The patient, Mrs. J. L., then aged fifty years, was admitted to hospital on August 4, 1920, suffering from ascites. There was no suspicion of alcoholism. She had three times suffered from febrile illnesses like typhoid fever, the first time at twenty years of age. There had been great increase in the size of the abdomen two weeks before admission, but she had been ailing in some way previously. Hæmatemesis had occurred four weeks before admission. In the hospital after admission the blood-serum gave a strongly positive Wassermann reaction, though the patient was said to have five healthy children. The ascites required repeated tapping; the ascitic fluid was of low specific gravity. The urine was free from albumin and sugar, or contained a mere trace of albumin. There was occasionally very slight fever. Brachial systolic blood-pressure = 105 mm. Hg. On August 30, 1920, Mr. A. Compton opened the abdomen and let all the ascitic fluid run out. He found nothing else abnormal, excepting that the liver was rather small, hard and irregular, in fact, there was definite hepatic cirrhosis. The drug treatment was partly by cardiac tonics and diuretics and partly by potassium iodide and mercurial inunction. For some months she required *paracentesis abdominis* frequently, but after February 25, 1921, there was a long interval before the next tapping, on April 5, 1921, which was the last one.

When I saw the patient on October 19, 1921, she looked much better, healthier, stronger, and younger than she had previously looked; but the whole of the face and lips and the upper part of the chest (about the manubrium sterni) were covered with small linear telangiectases. (I regard linear and "spider-like" telangiectases in cases of hepatic cirrhosis as being degenerative in nature and mainly of toxic or infective origin.) There was absolutely no ascites, nor was there any subcutaneous œdema. The thoracic organs appeared to be healthy, and by palpation and percussion I could make out nothing abnormal in regard to the size of the liver and spleen. The Wassermann reaction was still (November, 1921) strongly positive.



The last time that I saw the patient was in January, 1922, when she was in a weak condition, having caught "influenza" two weeks previously. She, however, refused to become an in-patient again, and was lost sight of. In this case it seems clear that the hepatic disease was, in part at least, of tertiary syphilitic origin.

The following is an example of "late" cure of chronic ascites after the operation of omentopexy. The patient (M. M.), an otherwise moderately well-nourished young woman, aged twenty-one years, unmarried, was admitted on July 21, 1920, with chronic ascites, possibly connected with non-alcoholic hepatic cirrhosis. She had formerly enjoyed good health, but for the last two years had been subject to "bilious" feeling. Her abdomen had begun to swell six months before admission, and five and one-half months ago she had been admitted to another hospital where the ascites was tapped several times. After these tapplings, as I was kindly informed, an exploratory laparotomy showed nothing special beyond the ascites and a large hard liver. Omentopexy was performed. After the operation *paracentesis abdominis* had to be frequently repeated. When admitted under my care (because there was no room for her at the hospital where the omentopexy had been performed) her ascites had again to be tapped, and five and one-quarter litres ascitic fluid (of specific gravity 1010) were removed. There was likewise a little pleural effusion at the base of the right lung. Brachial systolic blood-pressure = 140 mm. Hg. The urine contained at first a little albumin, but was afterwards free from albumin and sugar. The Wassermann reaction was completely negative. *Paracentesis abdominis* had to be performed again on August 7th and August 28, 1920, but the patient was allowed to leave the hospital on September 4th. After that she required no tapping, though there was still ascites when I saw her on October 14, 1920. A year later (October 19, 1921) I heard from her that the ascites had disappeared, that she had required no further "operation," and that she was getting on quite well. I made a point of writing to the surgeon about the "late" good result of his omentopexy operation in this case, adding: "My own belief is that cirrhosis of the liver with chronic ascites is less often or less completely due to alcohol than it formerly was, and possibly omentopexy will be more often useful in modern non-alcoholic cases."

In regard to "late" good results of omentopexy I would specially refer to a paper by L. Mayer and J. Konings, of Brussels, in the *Bruxelles Médical* for March 15, 1923 (vol. 3, p. 502), on "Late Results of Omentopexy in Cases of Hepatic Cirrhosis."

In my opinion very feeble and degenerative patients ought not to be operated on, but alcoholism in itself is no contra-indication, as two of Mayer and Konings's three cases, and some cases that I know of, prove. Too much should not be done at the operation in the way of "exploring" the abdominal contents, rubbing the peritoneum, etc.; and the operation should be performed, if possible, under local anæsthesia.

In judging of the value of omentopexy, as I have already mentioned, it must not be forgotten that patients occasionally recover from chronic ascites supposed to be connected with hepatic cirrhosis after treatment only by *paracentesis abdominis*, even when the question of omentopexy or other surgical interference has already been brought up. In regard to diagnosis it may sometimes be hard to distinguish cases of chronic ascites connected with hepatic cirrhosis from ascites of syphilitic, tuberculous or cancerous origin. To syphilitic cases I have already referred. Cases of chronic ascites connected with perihepatitis ("Zuckergussleber" is the German term for its late stages), with or without old pericardial adhesion and the remains of old "polyserositis," are likely occasionally to give rise to difficulty in differential diagnosis. In some cases there may be considerable calcification in the old pericardial adhesions or in other thickened serous membranes. To class all such cases under the heading of "pseudocirrhosis" of the liver (Friedel Pick's "pericarditische Pseudolebercirrhose," 1896) is a mistake, for occasionally a little actual hepatic cirrhosis may be present in addition to the chronic perihepatitis ("Zuckergussleber"), old pericardial adhesions, etc.

In nearly every case of omentopexy (see above cases) repeated tapping will be needed after the operation and in successful cases the cure of the ascites is often a "late" one. Sometimes probably, in London, the hospital surgeon who performs the omentopexy never hears of a good, though "late," result, unless a surgeon or physician at some other hospital, where the patient happens to be afterwards admitted, takes the trouble to inform him.

## THE USE OF CONVALESCENT SERUM IN A CASE OF CONGENITAL MEASLES

By RENÉ COGNÉ, M.D.

Paris, France

---

THE peculiar gravity of measles in an infant born while the mother is in the eruptive phase of the disease is well known. Claverie's statistics<sup>1</sup> show a mortality of 66 per cent. But a new method of preventive treatment has given happy results in that it prevents the eclosion of measles in contaminated children or attenuates the infection when this is already declared. It has seemed proper to the writer to resort to this treatment in a case of congenital measles in an infant born while the mother was in the full eruptive stage and, as far as he is aware, this is the first instance in which this therapeutic measure has been applied to the newly born. We have thus been led to study this prophylactic serotherapy and the results obtained by others.

During the late war, Ribadeau-Dumas and Brissaud hit upon the happy idea of trying out a *curative* method for measles, consisting of injections of serum taken from patients convalescing from serious cases of measles. Their first essay was carried out in a patient presenting a very serious state and the result was encouraging. But other observers who followed this practice did not have such good results. On the other hand, a *prophylactic* serotherapy of measles has been more fruitful.

It would appear that the first attempts at the prophylaxis of measles were made at Tunis, in 1916, by Nicholle and Conseil. These observers injected the blood of a child in convalescence from measles into a younger brother with the view of protecting the latter from the disease. The result of this first essay was really remarkable, since of three children who had been in permanent contact with the patient two developed the disease, the third who had received the injection of the patient's blood remained perfectly well. Hence it is evident that the blood injection was prophylactic in its effect.

---

<sup>1</sup> "Thesis," Bordeaux, 1884-1885.

These same observers repeated the same experiment in the case of a two-year-old child who, after being in contact with a case of measles on July 29th, was given an injection in the same circumstances as above, on August 3d, with the result that he did not contract the disease.

Finally, in 1920, Nicholle and Conseil carried out the following experiment: A nursing mother, with a six-month-old offspring, contracted measles. The nursling was injected with 9 c.c. of maternal blood taken on the twelfth day of the disease. The infant remained perfectly well.

Given these remarkable results, Richardson and Connor, in the United States, resorted to this prophylactic measure in 1919. Their technic<sup>2</sup> is as follows: From 7 to 25 c.c. of blood serum is taken from the patient between the ninth and twenty-fifth days following the eruption and this is injected in the muscle of the subject. Nine children thus treated—and who had been exposed to measles—did not develop the disease. Similar encouraging results were obtained in South America by Torrès and Pacheco<sup>3</sup> and in June, 1919, in Germany. Degkwitz<sup>4</sup> carried out numerous experiments with the following results: Twenty-five children were exposed to the contagion. Each received from 2 c.c. to 4 c.c. of serum from convalescents. All remained well, while fifteen control children all developed measles. Encouraged by his first tentative, Degkwitz carried it out again on 172 Munich school-children. Those injected on the second to the sixth days after exposure did not develop measles, while the subjects injected from the seventh to the fifteenth days following exposure came down with the disease.

Since these fundamental experiments have been published, numerous observers, in France and elsewhere, have resorted to this prophylactic serotherapy. In France, we would mention Nobécourt and Paraf, P. L. Marie, Ruel, Debré and Ravina, Mery, Gastinel and Joanon, du Jung and E. Bernard, not to mention others. In Germany, Pfundler, Torday, Rietschel, Kütter, Glazer and Müller, and Maggiore, of Palermo, have all obtained similar comparable results.

---

<sup>2</sup> *Jour. Am. Med. Asso.*, 1919, p. 1046.

<sup>3</sup> *Arch. latina-meric. de Pediatria*, 1920, p. 305.

<sup>4</sup> *Zeitsch. für Kinderheilk*, 1920, p. 134.



Nevertheless, some French observers—although not contesting the application of this measure—have reported some contradictory results and a certain number of unsuccessful cases. Aviraguet, in particular, related at the March 20, 1923, meeting of the Paris Society of Pædiatry, that he was unsuccessful in 25 per cent. of his cases and that two children died in spite of the prophylactic injections.

At present, it would seem a demonstrated fact that these unsuccessful results were due, not to any inherent defect in the method, but to an insufficiently rigorous application of its use.

A few words in respect to "modified" measles are here necessary. In the preceding pages we have referred only to the use of this procedure as a prophylactic method. In other circumstances, Degkwitz, Müller and Glazer, Rietschel, P. L. Marie, Debré and Ravina have noted that children who have been injected with convalescent serum may develop measles, but that the affection in them runs a particularly mild course and offers special characteristics.

Now, how does this "modified" measles show itself clinically? To answer this question I cannot do better than to quote the excellent description as outlined by Debré and Ravina.

*Incubation.*—In the majority of cases, incubation is not prolonged; however, in some instances it may be somewhat longer than usual, as much as seventeen or eighteen days.

*Invasion.*—This is different from the onset of a normal measles. Catarrh of the mucosæ is either totally absent, which is usual, or else is extremely discrete, amounting to a mild degree of nasal snuffles. Koplik's sign is invariably absent; the temperature generally does not go above 38° C. (100.5° F.). In some cases it remains normal, so that it can be said that, in the majority of cases, the incubation period is absent and that the disease at once begins with the rash.

*Rash.*—It is sometimes discrete, amounting to a few localized maculæ, usually appearing on the body, exceptionally on the lower limbs, the face and neck usually being quite free. On the contrary, in some cases the rash is generalized, possessing all the characters of an absolutely typical morbilliform eruption. But what is striking in these circumstances is the contrast between the relative intensity of the exanthema and the usual total absence of any enanthema: No oculonasal catarrh, no bronchial catarrh. In some children the soft

palate and throat are slightly reddened, while in others the color of the mucosa is not changed. There may be no rise of temperature from the onset to the end of the disease, or the mercury may range around  $100^{\circ}$  to  $101^{\circ}$  F. for two, three or more days. In a few cases there has been a temperature of  $101.5^{\circ}$  F. to  $102^{\circ}$  F., lasting for a few hours in the evening when the rash appeared. In some very exceptional cases the temperature rises slowly, remains up for a time, the chart recalling that of ordinary measles.

But whether this "modified" measles be apyretic or somewhat febrile, there is a *constant phenomenon*, namely, *the persistence of an absolutely perfect state of the general health*. In the great majority of cases, the child is so little ill that he eats well and plays in bed during the entire evolution of the malady. In cases where the eruption is normal nothing could be more striking than the association—during the evolution of an authentic case of measles—of a confluent measles erythema and a persistent feeling of well-being in the little patient, as well as a complete absence of catarrhal manifestations.

In these circumstances it is not surprising to note that none of the subjects with "modified" measles has developed any of the usual complications, such as otitis media or broncho-pneumonia.

From these clinical data it ensues that children with "modified" measles probably derive a permanent immunity against future attacks of the disease.

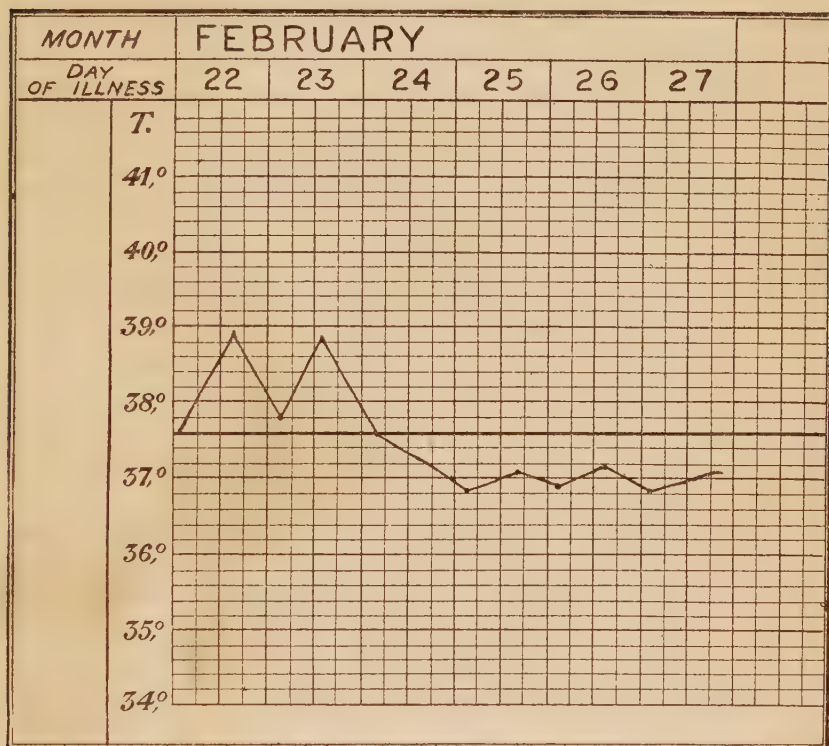
It is, however, essential to distinctly distinguish a "modified" measles from benign measles. When is measles benign? In answer to this it may be said: (1) On account of an attenuation of the exanthema; the course of the malady may be entirely or nearly confined to some catarrhal manifestations. The exanthema is extremely discrete or even may be absent. (2) An attenuation of the general symptomatology. (3) The short duration of the evolution; all the morbid manifestations are very discrete, the case representing the so-called "aborted measles." (4) An attenuation of the catarrhal manifestations.

However, many observers do not admit the reality of the attenuated types of the disease in which catarrhal symptoms are absent. What characterizes "modified" measles is precisely the absence of

catarrh. The subjects offer the symptoms characteristic of the benign type of the disease, although occasionally the exanthema is fairly well developed, *but all catarrhal manifestations are wanting.*

Having now briefly reviewed the subject I will report in a few words my case. (Chart I.)

CHART I.



J. L., *æt.* thirty-one, primiparous. Pregnancy normal. Last menstrual period, May 23, 1922.

Patient entered clinic on February 21, 1923, in the phase of invasion of measles. General malaise, oculonasal catarrh, cough. No sibilant râles. The symptoms became more marked on the following day.

February 23. Appearance of exanthema which was almost confluent on the face. Labor began at midnight.

February 24. Normal delivery at 8 A.M. The cough ceased when the labor began. The evolution of the exanthema, which had already involved the thighs, ceased. Convalescence began at once and by February 26th the rash had disappeared. Desquamation very discrete.

The infant, a female, was in excellent condition, weighing 3550 grams.

February 26. Subcutaneous injection of 3 c.c. convalescent measles serum (2 ampoules of 1.5 c.c. each obtained from two different subjects) given to the infant. No reaction. The baby, who had been taken from the mother at birth, was given back to her for nursing.

February 28. Baby had a temperature of 38° C. (100.6° F.). On the following day it dropped to 36° C. (97° F.) and never went up again. Some diarrhœa.

March 2. The infant developed a morbilliform rash over the body and on the roots of the thighs in front and behind.

March 4. Disappearance of the exanthema. At no time were there any catarrhal symptoms. However, the diarrhœa continued for ten days. Nursing was carried out normally.

To sum up, the following conclusions may be deduced from this case: (1) It was an instance of *congenital measles*. The child was unquestionably contaminated by the mother, because the exanthema developed on March 2d, while labor took place on February 24th. There was no other source of contamination possible. (2) Given the gravity of congenital measles—the child being born when the mother presents a marked exanthema—the benign evolution of the disease in this baby must be insisted upon. (3) This instance of congenital measles offered all the characters of a “modified” measles. The absence of any catarrhal manifestation is to be especially noted. (4) It would seem logical to conclude that the benign evolution of this case was due to the injection of convalescent serum.

To conclude this short paper, I will say a few words as to the practical application of this prophylactic serotherapy. And at the start I would say that the procedure is governed by three fundamental rules: (1) At *what time* should the serum of a convalescent from measles be taken? Debré and Ravina deem the most favorable time to be between the ninth and eleventh days following the drop of the temperature. (2) What *quantity* of serum is to be injected and at what *date* should this be done? According to Degkwitz the injection can be given up to the fourth day following the exposure and that 2.5 c.c. serum is sufficient. On the fourth and fifth days from 5 c.c. to 6 c.c. of serum are necessary. On the seventh day, even with massive doses, it is not at all certain that the patient can be rendered immune, while when given on the eighth day the outcome is practically certain to be unsuccessful. (3) How should the serum be prepared? After being assured that the donor has neither syphilis nor tuberculosis, Degkwitz preserves the serum withdrawn in the ice-chest, after adding one drop of a 5 per cent. carbolic acid solution



to each 10 c.c. of serum. Nobécourt and Paraf heat the serum twice, with an interval of twenty-four hours, at  $56^{\circ}$  C.

Debré and Ravina's technic is simpler. Several sera obtained from as many convalescents are mixed in equal proportions together. A Wassermann and a bacteriological examination are made of each serum. After mixing, the serum is kept on ice. Given the difficulty of procuring sufficient quantities of serum collected in perfectly satisfactory conditions, they raised the question as to whether or not it might be feasible to employ serum from adults who had had measles in childhood and therefore were immunized. Experiments have been undertaken to verify this hypothesis, with the result that sera obtained in these circumstances were too weak in their action.

# SURGICAL TUBERCULOSIS OF THE SPLEEN

WITH THE REPORT OF A CASE

By J. L. MAGNAC, M.D.

Ex-Interne of the Versailles Hospital, Versailles, France

---

THE present study is distinctly limited to the subject of surgical tuberculosis of the spleen. This form of splenic T. B. is also termed localized tuberculosis—which is more exact—and primary tuberculosis of the spleen, a term requiring an explanation. The designation of primary tuberculosis does not signify that the invasion of the spleen by Koch's bacillus has preceded that of some other viscus which, for that matter, would seem an impossibility; it signifies that the splenic tuberculosis has undergone an autonomous evolution quite independent of any other tuberculous focus in the patient. It is, in reality, the centre around which the other symptoms gravitate; and if by chance another tuberculous focus exists in the patient its relation to the splenic localization is that of an attenuated or extinct focus, the remains of a former acute process. Surgical tuberculosis of the spleen is comparable with tuberculosis of the kidney, with this difference that, far more than the latter process, it requires earlier surgical treatment because, as I shall attempt to show, there is no medical treatment for tuberculosis localized in the spleen.

The morbid process under consideration has been met with at all ages—in children, adults and elderly subjects. It is more common in adults, especially in the female.

From recorded cases, it would seem that pregnancy acts as a predisposing etiological factor and I have notes of several cases from the literature reported by Franke, Burke, Bland-Sutton and Delore, where the tumor was first discovered after labor. In the majority of cases no distinct etiological factor has been discovered, but usually there has been a personal or hereditary history of tuberculous infection. This is an important point and should invariably be searched for in the patient's antecedents from the viewpoint of diagnosis, which is a matter of considerable difficulty.

*Pathology.*—A spleen presenting a localized tuberculosis is always increased in size. The organ may weigh one or several kilograms, instead of 170 grams which is the normal weight. In the twenty-four cases that I have found in the literature in which operation was resorted to the weight of the spleen varied from 300 grams (Lannelongue) to 4000 grams (Comminotti). The average weight was from 1200 grams to 1500 grams. The dimensions of the organ were increased in all directions. The vertical diameter (height) was usually about thirty centimetres; the frontal diameter (breadth), eighteen centimetres; and the antero-posterior diameter (thickness), ten centimetres. Regardless of the increase in size the spleen retains its normal shape in cases where the organ is hypertrophied *en masse*; however, in those instances in which the tuberculous lesions are especially localized at one of the poles of the viscus, the diseased area only may offer a change in shape.

The exploring hand which attempts to appreciate the contours of the splenic tumor may find the organ perfectly free—an uncommon condition—or adherent to the surrounding structures—diaphragm, stomach, pancreas, intestine, kidney, aorta, vena cava, etc. The adhesions are at times so intimate that splenectomy was found to be impossible. In their operations, Hayden, Quénu and Baudet and Ciaccio were obliged to resort to marsupialization or even to let things alone.

The splenic capsule is usually thickened; grayish granulations or nodules varying in size from a walnut to an orange may be present on the surface of the organ. These nodules may be single or multiple.

The tumor, which is generally solid, may be composed almost entirely of a voluminous cold abscess attaining the size of a child's head. In these circumstances it assumes the aspect of a cyst with a purulent content. Such was the condition in my case, but I have been unable to find a similar one in the literature.

As may be readily foreseen from what has been said, a tuberculous process in the spleen can offer the most varied conditions, just as in other viscera.

Observers have described, perhaps too schematically, a massive, hemorrhagic, necrotic and sclerocaseous form of the process, but in reality, an histologic examination of the lesions shows that, as in

other organs, tuberculosis of the spleen occurs in three principal forms, namely, (1) capsular, subcapsular or parenchymatous granulations. More or less numerous, they are sometimes so small and discrete that they are hardly visible to the naked eye. Histologically, these granulations present a more or less typical follicular structure.

(2) Tubercles usually with circular or irregular contours, polylobulated and variable in number and size. Most frequently they give rise to the sclerocaseous forms of the process. On section, they are found at the periphery or in the midst of the splenic pulp in the form of whitish blocks, sometimes with a chalky aspect and a consistency of mastic. They are distinctly walled off by a fibrous shell on the borders of which a lymphoid infiltration and tuberculous follicles are to be seen. Starting from the capsule, large fibrous bands invade the parenchyma, forming large areas in which the reticulated web-work has undergone a notable thickening.

The blood-vessels are the seat of endo- and periarteritis and by rupture produce blood collections in the meshes of the splenic tissue. Malpighian corpuscles have a tendency to disappear.

Koch's bacillus has sometimes been discovered in the lesions, but usually the organism is absent, although animal inoculation, with properly chosen fragments of the spleen, will be positive.

(3) Cold abscess of the spleen of the pseudocystic type as in my case.

As to lesions of other viscera it is frequent to find the lymph-nodes of the hilum in a state of hypertrophy hardly larger than a walnut and presenting all the macroscopical and microscopical characters of tuberculosis of the glands. In the primary form of splenic tuberculosis—with which this paper is solely concerned—apparent lesions of other organs do not exist excepting the adhesions, most usually tuberculous in nature, which they may contract with the diseased spleen.

*Symptomatology.*—(1) *Splenomegalia*. It may be said that what dominates in the history of surgical tuberculosis of the spleen is an absence of characteristic symptoms. A single constant sign of the process is splenomegalia.

The presence of a tumor in the left hypochondrium will probably have been remarked by the patient and it is usually on account of



this that the physician is consulted. The tumor is readily seen on account of the change of outline of the abdomen, there being a very pronounced degree of forward bulging resulting in a notable asymmetry. Usually this bulging occupies the left lower portion of the thorax, occasionally extending to the epigastrium.

Palpation, which is easy because there is total absence of ascites and emaciation of the patient common, allows one to detect a tumor filling the entire left hypochondrium, extending downwards towards the iliac fossa and to the right as far as the xyphopubic line, passing under the umbilicus. The tumor may even extend beyond these limits to the right. Behind, the tumor may reach as low as the sacrolumbar muscles, distinctly in contact with them, as occurred in Delore's case and my own.

The general outline of the tumor may be oval or spherical, extending from the left costal margin to the iliac crest. Its anterior edge cannot always be made out, while in other instances the exploring hand can distinctly detect the incisures of the organ so that a diagnosis of splenomegalia can unhesitatingly be made.

The surface of the tumor may be smooth or, on the contrary, covered with rounded nodules of variable dimensions. In consistency it is either renitent or of woody hardness. Usually movable spontaneously, the tumor follows the respiratory movements and it can be made to move by palpation in a transversal direction, less frequently in a vertical direction. On the other hand, in some cases the organ is intimately adherent to the surrounding viscera by compact adhesions, thus forming an absolutely fixed mass, making splenectomy impossible.

Percussion reveals dulness of variable extent which may blend with the liver dulness above and inwardly. Repeated examinations will usually reveal a progressive growth of the tumor.

All the physical signs enumerated offer no character that distinguishes localized splenic tuberculosis from other forms of splenomegalia, so that the physician should obtain as much information as possible from examination of the other organs and laboratory tests.

*Examination of Other Viscera.*—The pulmonary apparatus, the lymphatic system, the bones and joints should receive special attention.

I do not think that those who have reported cases of localized

splenic tuberculosis have under-rated the importance of the examination of these organs. Some make no mention of it, while others state that this examination was negative. And nevertheless in several case reports I find that the patients or their antecedents had had pulmonary, pleural or lymphatic tuberculosis—cases reported by Quénu and Baudet, Delore, Albrecht, Grillo, and Kummel.

On the other hand, we all know how hard it is to elicit precise explanations from patients in respect to their state of health, especially during childhood and adolescence, as well as the health of their parents. Hence a minute and methodical interrogatory is most essential and this should be repeated if necessary, because information thus obtained has a very important bearing on the diagnosis. Positive tuberculous antecedents constitute a finding of the greatest value. In conjunction with splenomegalia, it furnishes very strong presumption in favor of tuberculosis localized to the spleen. All the other signs that have been described are so variable and inconstant that a knowledge of them will be of no help in the difficult diagnosis of this morbid process.

Digestive disturbances have been referred to as a capital symptom when combined with splenic enlargement. In reality, they are often completely wanting and when they exist they do not offer any particular character. Anorexia, a coated tongue, malodorous breath, slow and difficult digestion, frequent intestinal colic, vomiting of food, diarrhoea or constipation, certainly have little diagnostic meaning!

Pain is quite as variable; it may be completely absent. When it occurs, it may be in the form of a simple malaise or very acute suffering, giving the patient no respite, being increased by pressure or movement, shooting throughout the left side and into the left shoulder and thigh.

Finally, hypertrophy of the liver, with hepatic insufficiency and hyperglobulia, has been mentioned. But in these circumstances the case is no longer a tuberculosis localized to the spleen, because these symptoms prove that the infection has extended to the liver, so that the process will rapidly progress to death and is no longer in the domain of surgery.

*The General Health.*—Patients with splenic tuberculosis are generally emaciated, a rather constant condition. Very rarely they

suffer from hemorrhage—epistaxis, hæmatemesis, melæna. The temperature is variable; it may not be raised or when fever exists, it affects the intermittent character of paludism. Rarely high, it hardly ever goes above  $101^{\circ}$  F. Lastly, mild anæmia is the rule.

*Laboratory Tests.*—All writers on the subject have referred to hyperglobulia. Personally, I have not met with it. This symptom, to which many interpretations have been given, when it exists, in reality coincides with the hypertrophy of the liver (Lefas, Rendu, Widai). Therefore it arises with the phase of generalization of the splenic tuberculosis.

On the contrary, I have noted in several case reports a slight decrease of the red cells whose number varies between two and four millions. The white cells are normal—6000 to 8000; while the leucocyte formula is also about normal.

Blood examination also furnishes data which only have a negative value, in the sense that they will eliminate various affections comprised in the class of leukæmias and parasitic affections—syphilis, echinococcus, hematozoaria.

Finally, no method should be neglected susceptible of revealing tuberculoses. Tuberculin inoculation, cutireaction, intradermo-reaction and Arloing's and Courmont's reactions should be resorted to.

*Prognosis.*—The evolution of primary tuberculosis of the spleen is invariably fatal. It usually takes place by successive acute outbursts during which the spleen increases in size. The duration of the process averages about two years, but it may suddenly assume a rapid progress, the patient dying in a few weeks. The liver and lymph-nodes are the organs most usually involved and indicate generalization of the tuberculosis, hence when this occurs it is a contra-indication to surgical interference.

Death occurs, in point of fact, from generalization of the process—hepatic, peritoneal, pulmonary or meningeal tuberculosis—with all the various symptoms belonging to each.

*Diagnosis.*—This is one of the most difficult met with in practice, simply because this affection possesses no pathognomonic symptom. Even after splenectomy, there may be much doubt until the organ has been submitted to histological examination. In 1913, Villard

and Santy reported a case of massive tuberculosis of the spleen, before they had received the report of the microscopical examination. A week later they announced that they had made a mistaken diagnosis. In reality it was a malignant tumor of the organ which, clinically and macroscopically, presented all the characters of splenic tuberculosis.

Of nineteen case reports that I have collected, the pre-operative diagnosis was only made once. The reporter (Kummel) tells how he was led to make it. He says: "I made the diagnosis before operation, in the first place, because I had just operated on a similar case, and, secondly, because the patient was under treatment for a congestive attack in the pulmonary apices and in childhood had presented tuberculous adenitis."

Personally, I incline to the opinion that if the diagnosis of tuberculosis of the spleen is not made more frequently, this is due to the fact that the process is supposed to be so rare that, in practice, it will never be thought of. Nevertheless the physician should always have this affection in mind when in presence of a large spleen, especially if the patient gives a history of tuberculous antecedents and of no malaria. The diagnosis of localized splenic tuberculosis is the important one to make, because the life of the patient is at stake.

The physician should, in the first place, assure himself that he is in the presence of a tumor of the spleen and afterwards that this tumor is tuberculous in nature. Hence, this means that a differential diagnosis from all the splenomegalias must be made. I have little to add to what is generally known but I would merely remark that it is not always an easy matter to affirm that the case is one of enlarged spleen. In the case reports that I have consulted, tuberculosis of the spleen has been mistaken for cancer of the left colonic angle (Lannelongue and Vitrac), of the stomach (Strehl), and a left-sided hydronephrosis (Bayer). Neoplasms of the digestive tract are smaller and are accompanied by symptoms properly belonging to them.

Tumors of the kidney may be much more difficult to differentiate from splenic tumors. In these circumstances the functional disturbances of urinary secretion—pyuria, albuminuria and hæmaturia—are to be taken into consideration much more than the physical



signs, because in several instances the spleen was distinctly in contact with the lumbar region, as in Delore's case and my patient. Lastly, if necessary, the ureters should be catheterized.

When splenomegalia has been recognized one should next go into the personal and hereditary antecedents of the patient, which may give a clue as to the tuberculous nature of the splenic process. I do not hesitate to repeat that this examination is of capital importance and one must never fail to complete it by laboratory tests—tuberculin injection, serodiagnosis, etc. Next, consider all the various secondary types of splenic enlargement dependent upon some acute process, such as typhoid, infectious endocarditis, etc., or an hepatic cirrhosis—alcoholic, biliary or cardiac.

Malarial splenomegalia may be quite difficult to differentiate from tuberculosis of the organ. The mistake has been made on more than one occasion—I made it myself. In paludism, the spleen has a tendency to develop rather more in a transversal direction towards the umbilicus than vertically (Rendu), but I have several case reports of splenic tuberculosis in which the tumor reached, or even extended beyond, the umbilicus. The notion of the existence of malarial attacks, the presence of the parasite in the blood and the good results obtained from quinine will settle the diagnosis.

Likewise, in syphilitic splenomegalia, there may be diagnostic difficulties. In this case it is not the signs offered by the spleen, but the patient's antecedents, the detection of other luetic stigmata and the test treatment that will make the diagnosis.

In several case reports (Quénu and Baudet and my case) an hydatid cyst was considered possible, and this was all the more plausible from the fact that my case was a primary tuberculous pseudocyst of the spleen. In these circumstances the hydatid thrill should be searched for, as well as the other minor signs of hydatids which are the same for the spleen as for the liver, such as urticaria, pruritus, etc.

Blood examination in the case of hydatids will show eosinophilia, while a positive Weinberg test will settle the diagnosis in favor of this disease.

Primary cancer of the spleen is very rare. The liver is also hypertrophied, with jaundice, hemorrhages and intraabdominal

pressure disturbances. Blood examination shows the picture of marked anæmia.

Secondary cancer, which is more common, may be dependent upon neoplasms of the kidneys, stomach or liver. The spleen is deformed by neoplastic nodes which set up adhesions at the periphery of the organ and give to the feel a bossed sensation. The weight of the spleen may exceed 2000 grams. Its resemblance to tuberculosis of the organ may be such that a differential diagnosis is almost an impossibility. Hence, the primary malignant focus is essential to discover. A progressive cachexia is suggestive of neoplastic hypertrophy. Blood examination should never be neglected as it will often reveal deformities of the blood-cells and a temporary leucocytosis, both of which are absent in tuberculosis of the spleen. The differential diagnosis with the various types of leukæmias is readily made by blood examination.

There remains the class of primary splenomegalias—Delore and Bruhl's disease—and Banti's disease which is impossible to classify etiologically and whose existence does not appear to be very distinctly demonstrated. As Weil says: "Recent researches seem to show that frequently atypical splenic tuberculosis occurs in the form of essential splenomegalia, whose true nature has, up to the present, been misunderstood."

From what has been said, it is clear that the diagnosis of localized splenic tuberculosis does not depend so much on the examination of the spleen as on the personal and hereditary antecedents of the patient and laboratory tests, as well as on examination of other organs, especially the lungs, bones and lymphatic system.

Before discussing the treatment of the affection under consideration, I will give the history of my case.

Female, *æt.* fourteen and one-half years, entered Versailles Hospital, service of Doctor François, October 13, 1921. Patient's father and mother in good health. Personal antecedents: Whooping-cough in early childhood; measles three years ago running a normal evolution; a bronchitis last year, an affection to which the child did not seem to be subject according to the parents.

*Present Illness.*—Three months ago the patient consulted a physician for some slight ailment accompanied by a certain degree

of anæmia—pale conjunctivæ, irregular painful menstruation. She was treated for malaria because a large area of splenic dulness was detected. It would seem that the temperature never exceeded 38° C. (100.8° F.). There had also been a slight left-sided dry pleurisy which, clinically, had left no trace.

Since this incident the child had noticed a forward bulging in the lower left lateral region of the thorax, corresponding with splenic topography. This localization had disappeared and had now given place to a painless tumor in the left hypochondrium with considerable forward bulging.

The tumor could be distinctly outlined. Its intestinal border descended from the left costal border towards the umbilicus, slightly passing the middle line one finger's breadth above the umbilicus; it was inclined to the left and descended obliquely downwards and outwardly, finally becoming confounded with the lumbar mass of muscle. The relief of the tumor was equal, smooth and tense, with a renitent consistency.

By percussion, the tumor could be distinctly outlined on the inner side and downwards. To the inner side it was separated from the hepatic dulness by a line of resonance, while upwards and outwardly it became confounded with the splenic dulness. During percussion, the patient said she experienced a sensation of thrill in the tumor, but it was supposed that perhaps this sensation might result from gastric dilatation with food stasis, because it was especially manifest after ingestion of food. The tumor was distinctly in contact with the lumbar region.

Examination of the digestive apparatus was negative. The appetite was good and no disturbance was complained of, and although the process of digestion appeared to be somewhat long, no malaise was noted. Bowels were regular.

The respiratory tract was normal and no trace of the former pleurisy could be detected.

Heart normal, pulse regular at 77 and well struck.

Temperature constantly at 37° C. (98.6° F.).

*Urinary Apparatus.*—No disturbance of the urinary secretion. Urine clear, no albumin, no sugar. Palpation could elicit no pain in the kidneys.

*Genital System.*—Normally developed girl, menstruation at fourteen years, but only twice and each time rather painful. Since the present illness began three months ago, the menses had not appeared.

Nervous system normal.

Radiography of left renal region negative. Radioscopy by Doctor Hadengue revealed: (a) A marked aërophagy with succussion sound heard some distance from the patient. (b) An opaque mass lying in the left hypochondrium shading off towards the flank. The mass appeared to be separated from the shadow of the liver by the very bright area of the gastric air-pocket. The liver was not enlarged. (c) It seemed as if the mass perceived by palpation had either a splenic or juxtasplesnic origin. (d) There were some slight costo-diaphragmatic adhesions on the left side resulting from a dry pleurisy.

*Blood Examination.*—Eosinophilia absent. Weinberg's reaction negative. Tuberculin cutireaction positive. Red cells = 4,800,000. White cells = 7500.

*Cystoscopy.*—In order to eliminate the possible diagnosis of congenital hydronephrosis the ureter was catheterized and found to be completely patent and no renal retention.

Operation December 15, 1921. Ether anæsthesia. Transversal incision extending from the tenth rib to the median line. As a block had been placed under the patient, this incision gave sufficient room and clearly exposed the field of operation. The tumor, when exposed, was found to be a cystic tumor of the spleen, over which the omentum was freely spread, presenting a few adhesions which were easily freed and ligated.

After freeing the posterior and superior adhesions, which were also very thin, the hand could be passed around the entire tumor. A rather severe hemorrhagic oozing occurred, but was controlled.

An attempt was now made to enucleate the tumor, but could not be done. Therefore a median incision, made vertically to the first incision, was made so that the entire left upper quadrant of the abdominal wall could be raised up as far as the costal border. Just then the patient made an effort and the tumor was delivered spontaneously outside the abdomen. It was found to consist of a cystic sac the size of a child's head, whitish in color and over which an enlarged and flattened spleen was spread. The cyst was intimately



connected with the splenic tissue, so splenectomy was the only possible operation. It was carried out with ease, the pedicle being long and thin. Ligature was easy and the pedicle stump was buried under a mass of omentum. A large drain was inserted down into the cavity left by the tumor and the abdomen closed by three layers of sutures.

Convalescence was perfectly normal without any local or general reaction. The drain was removed on the third day and the patient was discharged two weeks after the operation.

I saw the patient in May, 1923. At that time she was in excellent health, a fine-looking girl of seventeen, well developed and working regularly in a factory. She only complained of an exaggerated appetite which obliged her to eat a great deal.

*Pathology of the Tumor.*—Macroscopically, the specimen presented two parts: An upper one represented by the flattened-out spleen, and a lower part consisting of a whitish sac the size of a child's head. The sac was punctured through the splenic tissue giving issue to nearly 1000 c.c. of pus presenting a typical tuberculous aspect.

Microscopically, a zone of caseous substance was found. This zone was separated from the splenic tissue by connective tissue forming the wall of the cyst. The tuberculous nature of the lesion was made evident by the presence of numerous epithelioid cells and some giant cells in the splenic tissue close to the caseous centre. In parts more distant from the cyst, small infarcts were found here and there in the splenic parenchyma. With oil immersion some Koch's bacilli could be detected.

It now remains for me to say a few words in respect to treatment. A patient with localized splenic tuberculosis is bound to certain death if surgical interference is delayed. As a beginning for this paper I tabulated more than one hundred cases of primary tuberculosis of the spleen which had been published by physicians, and all ended in death because the diagnosis was only made at autopsy. I also pointed out that a still larger number of cases must have been overlooked at autopsy, because a primary localized splenic tuberculosis had become generalized to other viscera. It might be objected that tuberculosis may possibly involve the spleen so slightly that a spon-

taneous cure may ensue, so that both the patient and the physician may overlook the process. Now, were this the case, tuberculosis of the spleen would not have the gravity that I attribute to it, as it would easily be recovered from by the therapeutic triad of tuberculous processes in general.

In point of fact, if such attenuated splenic tuberculosis really occurred, it could not be diagnosticated since it would give rise to no symptoms.

In practice, it can be said that primary splenic tuberculosis always gives rise to splenomegalia and as soon as this exists the prognosis is fatal if surgical interference is not resorted to.

Therefore operation should be undertaken as soon as it is ascertained that a subject with splenomegalia offers bacillary antecedents. Should any doubt exist in this respect an exploratory laparotomy is indicated. If, with the spleen exposed, the state of affairs is still doubtful, a specimen of the tumor, adhesion, omentum and lymph-nodes of the hilum should be taken for microscopical examination and animal inoculation. If the result is positive, splenectomy should then be done. When there are strong presumptions that the spleen is tuberculous, the organ should be removed then and there.

It goes without saying that splenectomy is contra-indicated if the bacillary infection has extended to other viscera or is on the road to generalization. But how are we to know this? If the liver is hypertrophied—this organ, after the spleen, being the most frequently involved—and hyperglobulia with over 5,000,000 red cells is present, the bacillosis has already extended beyond the spleen.

Performed in time, splenectomy will often give favorable results. It is the only logical operation. Burke, Quénu and Baudet performed splenotomy in their cases, undoubtedly because at the operation they found splenectomy to be impossible or else they did not realize the true nature of the splenomegalia. By mere luck Quénu's patient recovered, although the final outcome of the case is unknown. Burke's patient died. It is evident that leaving behind a tuberculous focus, splenotomy can only be a useless and dangerous traumatism.

Here are the results of the eighteen operative cases that I have been able to collect from the literature to which I have added the

case here reported. I would say that I have notes of five others, but not having been able to verify them they are not included.

(A) Splenectomy impossible: 1 case

(B) Splenotomy  $\left\{ \begin{array}{l} 1 \text{ recovery} \\ 1 \text{ death} \end{array} \right.$

(C) Splenectomy  $\left\{ \begin{array}{l} 10 \text{ recoveries} \\ 6 \text{ deaths} \end{array} \right.$

Some of the case reports do not state if the recovery was durable. We know that Bayer found his patient in good health six months later, Fischer one year later, Kummel several months, Mariott eight months and Albrecht six months. The pregnant woman splenectomized by Grillo went to full term, while Carle's patient had two pregnancies after splenectomy. My patient was in excellent health eighteen months after removal of the spleen.

It is clear that the results of splenectomy for localized splenic tuberculosis are very favorable since recovery ensued in 67 per cent. of the cases, and I feel that this percentage could still be improved if more care were taken with the diagnosis.

The technic of the operation requires no comment. I would merely remark that as it is done on tuberculous subjects with a lessened organic resistance, the technic should be as little traumatizing as possible.

Primary or secondary hemorrhage is the principal danger of splenectomy, hence special care should be given to ligature of the pedicle and adhesions.

## SOME ASPECTS OF MIGRAINE

By A. H. GORDON, M.D.

Assistant Professor of Medicine, McGill University; Physician  
to the Montreal General Hospital, Montreal, Canada

---

THERE are two reasons which may be offered for an attempt to discuss a subject—that one wants to tell something, or that he wants to learn something. With all candor I assure you that the first was not my reason for venturing into this area, but it seems to me that since the earliest days of my medical life I have been attacked by people who were attacked by migraine, until in self-defence it became necessary to try to find out whether anyone really knew anything about it, and if so, how much, and it is the very flimsy framework thus acquired that I have brought before you to-day.

To relapse again into candor, I don't think anyone does know much about it, and I readily admit being of that company also.

To begin with, what are we talking about when we mention migraine?

For the purpose of this discussion we mean a headache, prostrating in intensity, paroxysmal in onset, and periodical in recurrence, which can turn a strong man into a worm, and make the affections of a woman dark as Erebus; which may pass as a legacy from generation to generation, and which attacks the girl as she approaches womanhood, and is said to leave her at the menopause but frequently doesn't.

It is the sort of thing that makes a mother stage-whisper to her children, "Be quiet! Your father is upstairs lying down," or extracts from your male patient the doleful news, "The wife's got another of her headaches," or that moves Mrs. Y. to say of Mrs. X., "she gets terrible bilious turns and brings up bile as green as grass"; or that makes us pleased to see a new patient with frequent headaches, and constrains us to give her our favorite prescription and a diet list, and with assurance bow her out of our consulting room, and which makes us less enthusiastic when she comes the second time—no



better; and which, on her third call still unimproved, makes us wish that she and her headaches were in Hong Kong.

Before taking up the pathology of the condition, we may sketch briefly the course of a typical attack of moderate severity.

The symptoms may be arbitrarily divided into four stages.

Frequently on waking in the morning the first phase may make its appearance as a sense of chilliness and fatigue and depression, sometimes with cold extremities and a clammy sweat and dizziness—as many people have described it, “like the premonitory stage of seasickness,” then may come ocular manifestations—black specks, moving lights and colors, or in the more well-defined attacks the curious serrated or fortification-like spectra, and it may be with hemianopia as well. These sensory symptoms are soon accompanied by a headache which takes up for a time the whole of the stage, and which appears as one describes it “like a rear tire gone flat when every pulse beat means a bump.” The typical headache is a hemi-crania, but this rule has many exceptions; the headache advances in intensity and the general misery merges into a nausea and the nausea gives way to vomiting; with this comes relief to some, but not to all, and hours or even days of combined headache and vomiting may ensue.

Every phase mentioned may at times be absent, but nearly every victim will have his full-dress rehearsals at which the whole orchestra severally and jointly plays the tune through to the end.

Add to this that between attacks the patient may be very comfortable, and is usually both active and efficient, and that on questioning, one finds in a large percentage of cases a parent or brother or sister is a sufferer from the same complaint. With this description as a background, from which all details have been purposely eliminated, we may look at a few of the variants from the clinical picture as they have been illustrated by individual cases.

A young man of twenty-five, an accountant, was referred to me as a probable case of brain tumor.

His father had severe headaches, one younger sister also suffered from them.

His headaches began at fifteen years of age while going to school. He was first seized by a feeling of numbness in the right hand and

arm, with incomplete hemianopia and aphasia; this lasted about fifteen minutes, and was succeeded by a very severe headache, chiefly over the right eye, lasting half a day and followed by vomiting. These attacks are less marked in the winter, and get worse in the summer, coming as often as once or twice a week and are aggravated by mental worry or excitement. Between attacks there is no headache and no digestive disturbance. All examinations including that of the nervous system were negative, and the ocular fundi were normal. When seen about a year later he had gained in weight, and his attacks, though recurring, were less frequent and less severe. Here the association of numbness of one side, with hemianopia and aphasia, and headache and vomiting, made a strong case for gross intracranial disease, but the paroxysmal character, the long duration, the absence of all organic signs, and the retention of mental and physical health between attacks, and finally the correspondence with the typical march of an ophthalmic migraine made the diagnosis assured.

A case which interested me much, worried me more, and added nothing to my reputation, was that of a little boy of twelve who suffered from periodic attacks of abdominal pain with projectile vomiting.

These attacks had commenced at four years of age and had continued at intervals of from a few days to one month.

They were preceded by lassitude and distaste for food, and came on with severe abdominal pain which continued until a projectile vomiting of large amounts occurred, which gave relief to the pain. The attacks had no relation to food and after they passed off he felt quite well again. He had been operated upon for appendicitis four years before without relief, and when I saw him I suspected a partial obstruction of the small bowel.

His X-ray examination and all features of his physical examination were negative and there was no fever, but as he was incapacitated from school and play an exploratory operation was suggested, which showed absolutely no pathological condition to be present. He recovered rapidly from the operation but was neither better nor worse after it.

The subject of abdominal migraine is a dangerous one to venture

upon, dangerous for the physician but still more so for the surgeon, but I think that there is little doubt that such a condition does exist. An attack of epigastric pain and vomiting without fever, with or without diarrhœa, periodical in its appearance, either replacing a cephalic migrainous attack, or appearing in a person who has such attacks, should be carefully weighed and measured before its victim is submitted to abdominal section.

I would be the first to admit that a gall-bladder or an appendix or a pancreas or a gastric ulcer might be at the bottom of such a symptom complex, but in the light of the case to which I have referred I would be more chary the next time in advising operation.

Just here one might bring up the aspect of the subject which illustrates the mistakes which may be made upon the other side—the case which looks like migraine and which isn't.

Some time ago I had under my care a woman with a slight pulmonary tuberculosis, who had at each menstrual period a severe headache with vomiting and slight fever. The first two I felt were due to migraine, and the fever to her tuberculosis. She went away on account of her tuberculosis, and fortunately fell into good hands, for her physician was able to recognize iliac tenderness and sent her back to be operated upon for appendicitis.

After this was done she had no more headache and no more vomiting and no more fever. In this instance I had failed to note that her so-called migraine had developed very late in life for a true migraine, and I had misconstrued the significance of the fever.

Another woman with two children had suffered from periodic headaches with prostration and vomiting, but though there was no family history of headache, I looked upon it as migraine, though I had never seen her in an attack until on one occasion when it was more than ordinarily severe I had an opportunity of examining her, and found a slight temperature, and definite deep abdominal tenderness, and on inquiry found that she had had an "inflammation of the bowels" twenty years before.

These facts tended to dissipate the impression of migraine, and removal of an appendix and coincident pelvic repair have dissipated her symptoms.

Another instance showing that not all is migraine which has

a headache, was presented by a healthy looking young married woman of twenty-eight without children. She had suffered from frequent headaches for seven years and had been looked upon as a true migraine, but on routine examination, her systolic blood-pressure was found to be 240 and her diastolic 150. Her heart was considerably enlarged, and the second aortic sound very high pitched. The specific gravity of the urine was 1010, and it showed marked albuminuria with casts, and her optic discs were quite woolly in outline.

A regime suitable to her chronic nephritis has greatly helped her headaches, and now four years later she maintains a fair standard of health.

What has preceded is a sort of sketch of what migraine means and does not mean to us.

What, then, are the views which are held as to the causation of this extraordinary visitation upon mankind.

First—That there is no such thing as migraine, but that it is a name to cover headaches of diverse origins. This may be true, but I do not think so. The time may come when pernicious anæmia, diabetes, nephritis and migraine will be dissected and etiologically ticketed, as meningitis, rheumatism and peritonitis have been, but until that time comes I think we must recognize in migraine something apart from other symptomatic headaches, and with a clinical picture so constant and so well defined, it would be flying in the face of the obvious to do otherwise.

Second—That it is a metabolic disorder, with retention of toxic chemical substances.

The ultimate chemistry of the disease has certainly not been worked out.

There are rather fragmentary reports in the literature, of the blood and urine chemistry, and while some have shown slight variations from the normal, these are not constant and I have not met with any investigation extensive enough to base any conclusions upon.

In a number of instances which we have been able to investigate chemically there has been no evidence of abnormal retention.

At the risk of boring you with details, I would like to report an example of, to me, a classical case of migraine and his blood findings.



He was a physician, fifty years of age. As a child he was undersized but athletic. His father had recurring headaches. There were eleven in his family and three had headaches.

He had scattered attacks of headache in early childhood, but at twenty-two had his first bad one. He now rises with an aura of lassitude and inability to concentrate his mind; this is followed by headache, at first general, then localized in the right or left temple and this may last through the day and night. There is always slight nausea, and with severe attacks vomiting once or twice. He is hyperæsthetic to light, and sounds disturb him. There are spontaneous bowel movements and priapism. Attacks recur about every three weeks. Temperature, 98; pulse, 72; blood-pressure, 75/115. Physical examination is negative, Wassermann negative, urine negative.

Blood urea .....	14	mg. per 100 c.c.
Uric acid.....	.35	"
Creatinin .....	1.2	"
Chlorides .....	5.5	"
Sugar .....	0.09	per cent.

Here in the absence of renal or hepatic insufficiency, but with typical migraine for nearly thirty years, there is a practically normal blood chemistry.

Another instance is Miss R., with a typical family and personal history of migraine.

Her mother and a cousin on the mother's side suffered from severe headaches.

The patient's severe headaches followed an operation under local anæsthesia for a deviated septum. They appear over one or both eyes and become vertical, beginning in the morning and lasting all day.

Four or five times a year she has a severe attack of vomiting and epigastric pain as a climax of her headache.

Her physical examination was quite negative but in view of the long continuation of her headaches her metabolic chemistry was worked out with the following result:

Urea nitrogen .....	15	mg.
Creatinin .....	1.21	"
Uric acid.....	2.2	"
Chlorides .....	.421	per cent.
Phenolsulphophthalein excretion.....	51	per cent.
Renal meal—normal variation in the specific gravity.		
Normal night urine—urea excretion normal, slight water and salt retention.		

Here again we find a typical clinical migraine showing no retention of metabolic products as a reason for its presence.

Third—That it is a gastro-intestinal poisoning due to dietetic errors.

I think that we are all familiar with the Pott's disease which was caused by the nurse dropping the patient when he was a baby, but it doesn't change our minds as to the tuberculous nature of spinal caries, and in migraine as elsewhere the proof of the pudding is in the eating—or in the abstinence from eating. There are few cases in which the same food will always bring on an attack, and still fewer in which leaving food alone will prevent an attack.

Cross-questioning will usually elicit the fact that having had an attack, the victim puts the blame upon the last food he has eaten, but the evidence makes up in variety what it lacks in unity and continuity.

Fourth—That it is a reflex from eyes, ears, pelvis or elsewhere; one would be glad if this were so, but a long and patient trial in attempting to remedy migraine by correction of errors of refraction, and by other equally laudable allied efforts has not convinced me.

Fifth—That it is due to a vasomotor spasm.

This, too, has many points in its favor, and like the other view of sudden increase in the pressure in the cerebrospinal fluid, would account for many of the symptoms, but again the question comes "who frowed dat brick" and it would seem that this view only suggests a possible result as a possible cause.

The view of migraine as a disturbance of the pituitary gland is put forward by some writers, and one would thus explain the attacks: "In predisposed individuals the sella turcica is either too small or too much enclosed to allow of hyperplasia or engorgement of the pituitary body without the reduction of intrasellar pressure and this pressure determines the attack.

"Continued pressure causes erosion of the walls and enlargement of the fossa, thus causing the headaches to cease." He would explain the hereditary feature of migraine by the anatomical structure of the base of the skull.

Using this premise, the unilateral character of the headache will depend upon the side of the gland most enlarged, the so-called ophthalmoplegic type is due to pressure upon the third and fourth nerves and the cavernous sinus by the swollen pituitary glands.

As a development of this aspect of the question,

Genital and thymic causes for migraine are to be found in the

inefficiency of the function of these special glands and the complementary activity of the pituitary gland to compensate for them, with its consequent engorgement.

In the case of the thyroid, hyperactivity is said to increase the vascularity of the pituitary and again bring about headache. The criticism of these views is that migraine is an extremely common disease, while recognizable acromegaly and frank hypopituitarism are relatively rare.

If the gland were involved to an extent sufficient to cause erosion of its bony container, one would look for acromegalic symptoms after years of migraine but this does not occur.

In the matter of the explanation of symptoms by referring them to hyperfunction and hypofunction, not to say dysfunction of endocrine glands, one gets into deep water very easily, and when it comes to the compensatory activities of other glands to balance this hyper or hypofunction, the mind begins to reel a little.

There are very few of us who can be trusted with an explanation having three dimensions, and until endocrinology has become a science based upon many more established facts than are at present available, we would all be wiser to refrain from making it an easy way out of our diagnostic difficulties.

The criterion of the real hereditary nature of a disease is that it shall comply with Mendel's law, *i.e.*, that the determining factor of the disease shall be present actively or inactively in one or the other parent.

Among the products of a mating the ratio between those with the disease and those without it can only be ascertained by statistical tabulation of the offspring.

Buchanan, of the Mayo Foundation, studied 127 families each of which presented a case of typical migraine as above described.

To revert for a moment to Mendel's law—when a tall and a dwarf pea are crossed, a tall hybrid results. By breeding of these tall hybrids with each other, three talls to one dwarf are produced.

Of these talls, one always breeds true to talls, the dwarf breeds true to dwarf, the remaining talls breed issue of which the proportion is three talls to one dwarf. This continues indefinitely, each generation producing one pure tall and one pure dwarf as well as two talls

which have in them the power to produce three talls to one dwarf, this ratio of three to one being approximate. We may use the terms "with migraine" and "without migraine" in place of "dwarf" and "tall."

Buchanan's figures are as follows:

(1) Cases where father or mother had migraine. In 100 families there were 143 with migraine and 488 without migraine, a ratio of 1-3.13.

(2) Parents with migraine who had epileptic offspring. This group of seven families showed ten children with epilepsy or a migraine epilepsy syndrome, and thirty-seven without either, a ratio of 1-3.7.

(3) Mating of persons with dormant migraine. That is, people whose parents had parents or brothers or sisters with migraine. In this group thirty children had migraine and eighty-five did not have it, a ratio of 1-2.83.

(4) Both parents had migraine. Three such families were found and all the children, fifteen in number, had migraine.

The total number of children in the whole study was 198 with and 610 without migraine, a ratio of 1-3.08.

I will quote Buchanan's summing up which speaks for itself.

"Migraine is a distinct type of disease and should be easily identified after the appearance of symptoms.

"The disease is an expression of the mendelian ratio of 3.08 to 1. There is no medication known which will alter its course. It is a distinct part of the patient's economy and it will have no harmful effect upon his longevity."

I have attempted to lay before you some of the views as to the etiology of migraine, not all of them, else we wouldn't be home until morning.

There is scarcely an organ or tissue in the body which has not at some time or other been accused as the cause of the trouble, from displacement of a vertebra to colonic stasis; and our separated brethren who practise mysterious replacements and adjustments have not the monopoly of bizarre ideas or obsessions in this matter.

In the realm of speculation all men are free and equal, and he would be bold indeed who in the present state of our knowledge



or our ignorance, would be too dogmatic, but I confess to a strong leaning to the view which looks upon migraine as a type of constitution or personality as fixed, let us say, as the blood groupings, and as truly hereditary as hæmophilia.

The fixity of the clinical type without a discoverable morbid anatomy, and the relative futility of the various methods of treatment, would incline one toward this conclusion, not to mention the rather convincing argument in the mendelian ratio among the victims as worked out by Buchanan.

Shall we then when confronted by a sufferer from the disease tell him to go home and forget it, for we can no more help his attacks than we can change his gray eyes to brown or his red hair to black?

A similar attitude in pneumonia would let us say to one ill of it: Yours is a self-limited disease and the mortality doesn't change under any method of treatment, therefore treatment is of no use to you.

It has been said with truth of pneumonia that little can be done for the disease, but much can be done for the patient, and this is equally true of migraine, but first of all it must be proven that the patient has migraine, and it is in this way that we can do the greatest service to these people. There is no bodily condition in which the physician needs more to maintain his own equilibrium, or as has been said of a late Premier of Great Britain "to keep both feet on the ground," than in the consideration of this ailment. We are on the one hand confronted with so many states which may simulate migraine, a few of which I have touched upon, and there are as many others which migraine simulates. Then there is the other very evident fact that a sufferer from migraine has as much right to develop an attack of appendicitis or meningitis as any other more fortunate member of the community, and every headache or vomiting which the migrainous patient has, is not necessarily migraine. And as well as having no immunity against other grave diseases, he is not proof against the minor ills which may not be deadly in themselves but may make his migraine less bearable.

I refer here to errors of refraction, bad teeth, bad tonsils, flat feet, hemorrhoids and the other things which keep sick people from getting well, or well people from getting better.

Is this all you can do? one asks. No, it isn't. If you saw a race-

horse hitched to a coal cart and his owner asked for a tonic for him, you would likely advise him to take him out of the coal cart and hitch him to a sulky and he wouldn't need a tonic, and so the most useful thing we can do for a patient with migraine is to diagnose his type, and then realize that all the operations and the diets and the drugs that there are won't make the race-horse into a Clydesdale, and that the load must be suited to the horse and not the horse to the load.

Three things the person with migraine must have and can't get on without. These are freedom from worry, open-air exercise and ample sleep, add to this ample food—superalimentation instead of dietetic starvation—and we have gone a long way toward giving aid and comfort.

On the question of freedom from worry most people will say: That's all very well, but it's easier said than done. Quite so, but most worries are due to an attempt to answer some question *yes* or *no*, and it is much better, especially for the patient with migraine, to make even a wrong decision and stick to it than to be eternally picking at a daisy and saying yes, no, yes, no, yes.

About medical treatment—it's simple, there is none that I know of; there is the careful survey of the patient, and the careful attempt to remedy any coincident defect which interferes with the best standard of bodily health.

And what of surgery? Neither decompression of the pituitary nor cholecystectomy nor circumcision will cure migraine, the pituitary should be decompressed if it requires decompression, and cholecystectomy may be done if the gall-bladder demands it, and circumcision may be done if the foreskin requires it, but on no different basis in the migrainous individual from that in the non-migrainous, except perhaps that even more care should be taken that the indication is absolute.

As with gout so with migraine, more wise men than fools suffer from it, and the world owes much to these wise men, and to do their best work under their natural handicap we who have the care of them should give them at least the race-horse's care.

And what about the attack itself?

Every man probably works best with his own tools, and I have

found no better than Lauder Brunton's recipe of 15 grs. sodium salicylate and 30 grs. potassium bromide given at the first sign of the oncoming storm and repeated if necessary or possible.

In my hands when morphine seemed necessary, it tended only to postpone the evil day, and the attack proceeded on its way afterward with the added nausea from the drug.

A bed in a cool dark room and a cup of strong black coffee was the prescription of the late James Stewart, and I doubt if anything better has been found.

Above all things to treat the patient as a human being with an unbearable headache is a far better course than to set him in a groove and hold him in it because someone dead and gone or only dead has said: "Thus and thus shalt thou do."

# A CASE OF HERPES ZOSTER IN THE DISTRIBUTION OF THE INFERIOR MAXILLARY NERVE ASSOCIATED WITH PARALYSIS OF THE FACIAL NERVE

By JAMES HENDRIE LLOYD, M.D., and BLANCHE ELLIOTT, M.D.

Neurologist to the Philadelphia  
General Hospital

Interne in the Philadelphia  
General Hospital

HERPES ZOSTER is of interest to both the neurologist and the physiologist because it is believed to show in a very exact way the distribution of the sensory nerves. Henry Head, as is well known, utilized this disease for the purpose of mapping out the sensory zones, especially on the trunk.<sup>1</sup> His work was based on a study of 412 cases, in only twenty-two of which was the disease located in the territory of the trigeminal nerve, and of these, eighteen were instances of ophthalmic zoster, leaving only two each as instances of the disease in the territory of the second and third divisions of the fifth nerve.

The lesions in the nervous system are known to be located in the ganglion of the posterior root. This was first suggested by Von Bärensprung in 1863, and has since been confirmed by other observers. Head and Campbell examined the ganglia in seventeen cases, and found hemorrhages and acute inflammation, with destruction of the ganglion cells and degeneration of the peripheral sensory nerves. They examined three cases within the territory of the trigeminal nerve, in all of which they found changes in the gasserian ganglion.

The cause of the disease is undetermined, but the process has all the appearances of an infection. A few cases of what is called symptomatic zoster have been observed, as, for instance, in myelitis, caries of the spine, and tabes. In such cases it would seem that the original disease had spread to, or caused irritation of, the ganglion on the posterior, or sensory, root. But in the usual, or spontaneous, cases no cause of infection has been discovered. Head thought that herpes zoster and acute anterior poliomyelitis closely resembled each

---

<sup>1</sup> Henry Head, "Herpes Zoster, or Zona," "Allbutt's System of Medicine," vol. ix, p. 616.



other. In one the acute inflammation is in the region of the motor cells in the anterior horn; in the other, it is in the ganglion of the posterior root, where are located the cells of the sensory neurons. Hence the disease has been called by some writers "acute posterior poliomyelitis."

Herpes zoster in the distribution of the fifth nerve is usually confined to the ophthalmic division. This is the ophthalmic zoster, which is not so very uncommon. But the disease is much more rare in either the second or third division of the trigeminal. In one such case of herpes of the face Head and Campbell found a hemorrhagic focus in the gasserian ganglion. Head says that he had seen several cases of true zoster involving the third or inferior maxillary division of the fifth nerve.

In some few cases paralysis of one or other motor nerve has been seen in herpes zoster. Ptosis and paralysis of ocular muscles have been observed in ophthalmic zoster, but they are apparently very rare. Paralysis of the facial nerve has been seen in cases of zoster of the second cervical, in which the eruption is located in the occipital region and in an area on the front of the neck. Eichhorst, according to Head, reported eighteen such cases. This complication is difficult to explain; some reference will be made to it later. In the present case the paralysis of the seventh nerve was associated with herpes zoster in the area of the inferior maxillary division of the fifth nerve—a complication which we have nowhere found noted. Ramsay Hunt has described cases of what he believed were instances of herpes zoster of the geniculate ganglion, in which there was an associated paralysis of the seventh, or facial, nerve.<sup>2</sup> (Fig. 1.)

The geniculate ganglion is located in the aqueduct of Fallopius, and is usually described by anatomists as a part of the seventh nerve, with the trunk of which it is closely bound up. But this union is only in appearance, for the seventh nerve proper is a motor nerve; and the ganglion really represents a distinct sensory nerve, of which the *pars intermedia*, or nerve of Wrisburg, is the central prolongation, and the *chorda tympani* is composed of its peripheral axones. This

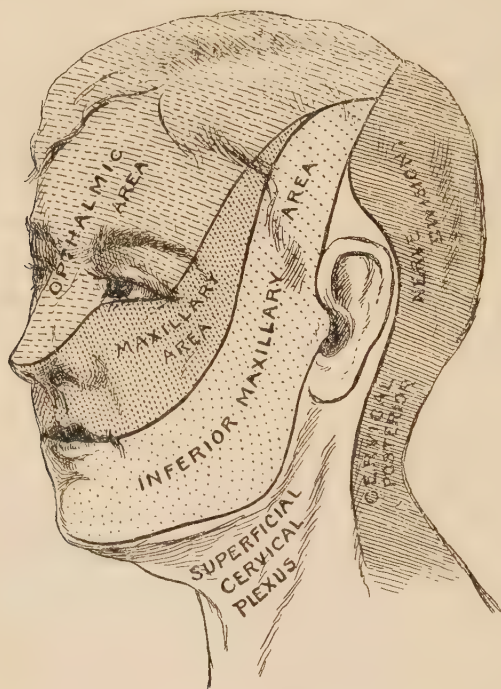
---

<sup>2</sup> J. Ramsay Hunt, "The Sensory Field of the Facial Nerve, etc.," *Brain*, vol. xxxviii, p. 418. This paper contains references to other of Doctor Hunt's papers, and to reports of cases by other writers.

complete sensory nerve, the sensory mate of the seventh nerve, has been called the thirteenth cranial nerve of Sapolini.<sup>3</sup>

Hunt, as just said, described a type of herpes zoster, the so-called *herpes zoster oticus*, in which the eruption is confined almost entirely to the auricle or external ear; a small area behind the auricle is also invaded. It is nearly always associated with paralysis of the seventh

FIG. 1.



Sensory areas of the head showing general distribution of the three divisions of the fifth cranial nerve.

nerve, and sometimes with tinnitus and vertigo, indicative of involvement also of the eighth or auditory nerve. The cases reported by Hunt and others have varied somewhat, and it has been suggested that there may be a *multiple* ganglionic involvement, especially of the geniculate, glosso-pharyngeal and vagal ganglia, and that the symptoms vary according to the involvement, or not, of these several ganglia. There may be some herpetic eruption on the anterior pillars

<sup>3</sup> Van Gehuchten, "Anatomie du Système Nerveux de l'Homme," pp. 531-534.

of the fauces and on the anterior region of the tongue. Hunt believed that these cases proved that the seventh nerve contains sensory fibres, and that these fibres are distributed to a small area of the skin as shown by the eruption. The vesicles may extend also deep in the external auditory canal to the tympanum.

It is not difficult to understand how, if Hunt is correct in his opinion that the geniculate ganglion is the seat of the lesion, the seventh nerve is paralyzed. It is bound up with that ganglion in a narrow bony canal, and an inflammation of the ganglion would readily involve the trunk of the nerve.

But cases occur in which the herpetic eruption is located in the area of the second and third cervical nerves, that is, in the occipital region and on the anterolateral side of the neck, and possibly in a small area on the face, and in which there is also paralysis of the seventh nerve. Claude and Schaeffer reported a case of *herpes occipitocollaris et oticus*, in which the herpes was in this distribution, and in which there was also paralysis of the intrinsic muscles of the eye, and of the abducens, the facial and the auditory nerves. Such a case would probably indicate a multiple ganglionic involvement. It is impossible to see how the disease in one ganglion could cause all these symptoms. The subject leads to a great deal of anatomical and physiological speculation for which there is neither time nor space here. The possible rôle of the sympathetic system should not be ignored.

In the present case the patient had been partially deaf from early childhood. The attack of herpes came on suddenly with giddiness, vomiting and severe pain in the lower part of the face. The eruption soon appeared on the face along with paralysis of the facial nerve. It might be plausible to suppose that there had been some extension of an old middle-ear disease into the fallopian aqueduct, thus implicating the facial nerve, as is not uncommon, and with the Ménière syndrome; but this could not explain the herpetic eruption, which, as shown in Fig. 2, is limited quite accurately to the area of the auriculotemporal branch of the inferior maxillary nerve, of which the ganglion of origin is the gasserian. But how this ganglion could be invaded from a disease of the middle ear, is not easily discovered.

## CASE HISTORY

The patient, a white man, aged forty-four, had had defective hearing since he was three years of age. His past history was negative for venereal infection or any serious illness.

He entered the Philadelphia General Hospital, August 21, 1923, with the following history. On August 13, 1923, he became nauseated, vomited, and began to feel so dizzy he was afraid of falling. There was no tinnitus aurium. At the same time all the teeth in his lower jaw ached, and there appeared vesicles and a palsy on the left side of his face, accompanied by intense pain.

On admission he was found to have herpes zoster in the distribution of the inferior maxillary branch of the fifth cranial nerve, and the left side of his tongue was very red with several aphthous-looking ulcers. There were also a few small white patches on the left anterior pillar. The same herpetic condition was reported on the anterior aspect of the external auditory canal, and the ear-drum was red along the handle of the malleus, but not bulging. There was complete paralysis of the left facial nerve, the patient being unable to wrinkle his forehead, to close his left eye and to smile on that side of his face, as is seen in Fig. 2.

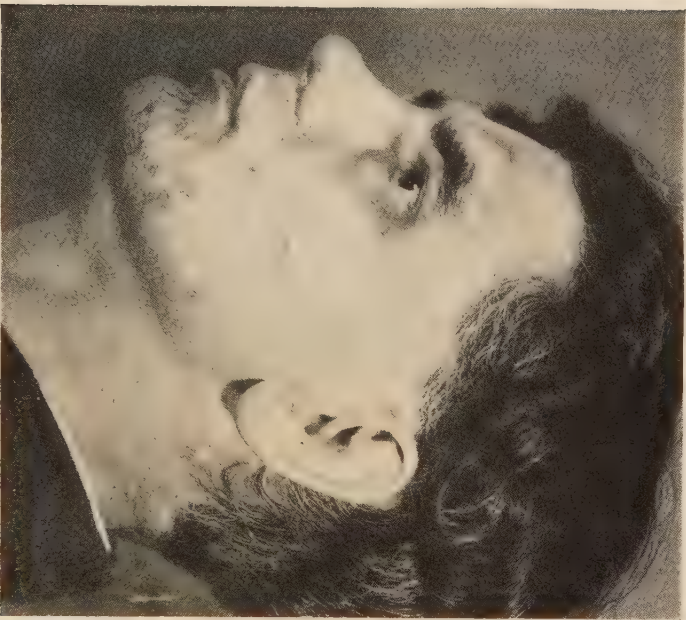
There was no disturbance of smell. The pupils were slightly unequal, the right being larger than the left, with normal reactions to light and on accommodation. The media were clear, and the fundus blood-vessels were normal. The optic nerve edges were clear and well defined. There was no strabismus, and there was no spontaneous nystagmus in looking to the left or in looking forward, but there was definite horizontal nystagmus when looking to the right, beginning as soon as the eyes were turned to the right. There was no rotary nystagmus when looking down or up, and sudden movements of the head had no effect on the eyes.

The Bárány findings were as follows: "There was past pointing two inches to the right with the right arm and with the left arm. Caloric cold, AD, five minutes; no rotary nystagmus, good horizontal nystagmus. Past pointing, vertical canals, two inches to the right. AD and AS, horizontal canals two inches to the left AD and AS. Past pointing was a little greater than that seen spontaneously. Caloric cold, AS, five minutes; no rotary nystagmus and no horizontal nystagmus. Past pointing, vertical canals, four inches to the left each arm, horizontal canals, AD two inches to the left, AS touch. Hearing AD conversational voice, AS loud conversational voice." Patient believes his deafness has not increased since present onset.

The III, IV, and VI cranial nerves were not affected. (Fig. 3.) There was diminished sensibility to touch, pain, temperature, and deep pressure along the course of the inferior maxillary branch of the left fifth cranial nerve, and there was complete loss of taste sense on the anterior two-thirds of the tongue on the left side. The corneal reflexes, the pharyngeal reflex, and protrusion of the tongue were normal, the tongue being pushed to the right side only by the asymmetry of the mouth. There was some difficulty in mastication on the left, but there was no weakness of either sternomastoid muscle. The gait with eyes open was rather unsteady, but with eyes closed, and in Romberg's position, there was decided swaying to the right. The knee-jerks were normal and there were no other physical abnormalities. Blood and spinal fluid tests were negative to all antigens, and the colloidal gold reaction was 0001100000; white blood-cells 4350.



FIG. 2.



Herpes of the face. (The eruption had somewhat faded.)

FIG. 3.



Herpes of the face, with paralysis of the left facial nerve.



It is suggested here by way of theory that in some of these cases the facial nerve may be affected secondarily to the eruption on the face. That is, the overlying eruption may by pressure or otherwise involve the underlying branches of the nerve after it has emerged from the skull. Or possibly the eruption may even extend into the fallopian aqueduct, and thus involve the trunk of the nerve. Another explanation might be that there had been a multiple ganglionic affection; but the case did not resemble Hunt's cases of herpes zoster oticus, as the seat of eruption was entirely different.

Sicard believes that the herpetic inflammation may affect not only the ganglion of the posterior root but also the posterior root itself, as well as the cells of the posterior horns and the sympathetic ganglia.<sup>4</sup> Some recent writers attach great importance to this alleged affection of the sympathetic system. If they are correct, this might explain the rather anomalous symptoms which are seen in some cases. The fact that the pupil on the side of the eruption was somewhat contracted in the present case may indicate that the sympathetic was involved.

---

<sup>4</sup>J. A. Sicard, "Questions Neurologiques, etc.," Paris, 1922.

# Rectal Diseases

## THE TREATMENT OF ANAL, ANORECTAL AND RECTAL FISTULÆ \*

By J. RAWSON PENNINGTON, M.D., F.A.C.S.

Surgeon to Columbus Hospital and U. S. Veterans'  
Hospital No. 30, Chicago

FIRST of all, what is a fistula? It is an infected artificial channel between the skin and mucosa (or serosa) of a normal cavity; it has two or more openings. A sinus (often confounded with a fistula) on the contrary is an infected artificial channel joining the skin or mucosa with an abnormal cavity; it has, as a rule, one opening only.

Next, our subject bespeaks a classification of fistulæ. They are to be arranged according to the anatomical position of the internal opening. One with this in the anus should be known as an "anal fistula"; when at the junction of the rectum and anus as "anorectal," because the internal opening then partakes of the characteristics of both the anus and rectum. Where the internal opening is in the rectum proper it should be classified as a "rectal" fistula. (Fig. 1.)

The gravity, other things being equal, is governed by the position of this internal orifice. A rectal fistula with a single tract, and with but one opening into the bowel, is much more formidable than an anal fistula of the horseshoe, or some other, variety, with two or more internal openings and twenty-five to forty, or more, on the buttocks. The number of external openings has but little to do with the relative gravity of a given case.

I have tabulated some 47,000 cases, from personal and other sources, to show the relative frequency of the various rectal affections. As might be expected, hemorrhoids were most common, 17,000 cases. But fistula was a close second, with 13,000, or 36 and 27.7 per cent., respectively.

---

\* Abstract of a clinic for the members of the Clinical Congress of Surgeons, held at the Columbus Hospital, October 25, 1923.



Now as to treatment: I have had excellent results in some instances by first cleansing the tracts with neutral solution of chlorinated soda, then injecting them with subnitrate of bismuth ointment. Phenol, peroxide, etc., may also be used where patients absolutely refuse more active measures.

Incision, that is to say passing a grooved director through and merely incising the fistulous tract (or tracts) and the tissues distal, and allowing the wound to heal by granulation, has been and still is almost universally employed. While it is the method of choice in all

FIG. 1.

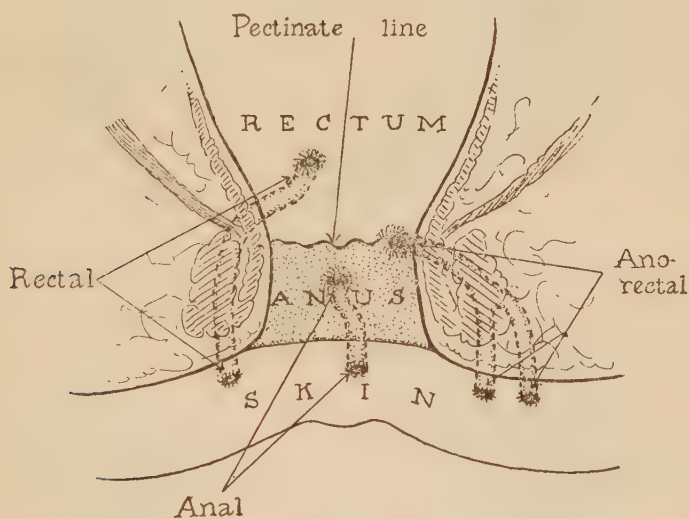
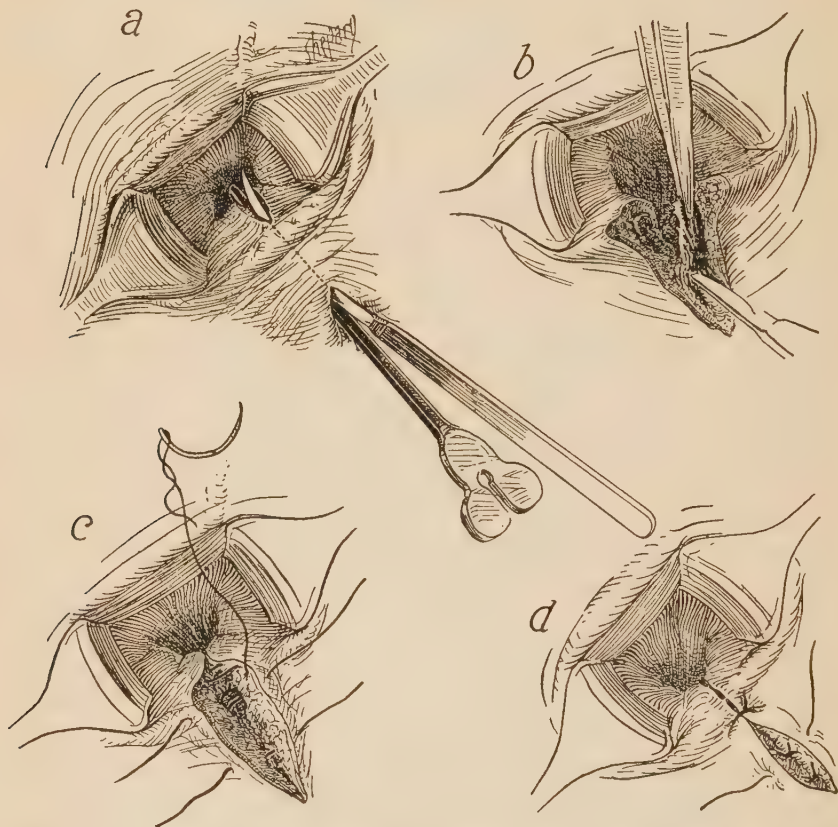


Diagram of rectal, anal and anorectal fistule.

examples, of the anal variety as well as in some instances of the anorectal type, it is entirely unsuitable for the true rectal fistula. A New York surgeon years ago wrote: "In 2196 cases operated on in general hospitals by surgeons, less than 45 per cent. of them were even claimed to be cured." As he failed to state the technic resorted to, it is reasonable to suppose at least 95 per cent. were operated on by this incision method, either with or without the famous "back-cut" of Salmon, and that sinuses or crevices were not discovered and removed, so these continued to reinfect the operative field. I believe this to be the reason because: (A) I have demonstrated repeatedly the presence of such tracks or sinuses; (B) it is the plan resorted to

by nearly all authors; and (*C*) simply splitting up the fistulous tract, and not removing the lining (or so-called "pyogenic membrane") when it can be done is certainly not good surgery. Again, such procedures necessarily prolong the period of convalescence, as well

FIG. 2.



Method of operating, in rectal fistulæ. (a) Passage of blunt-pointed director into fistula previously injected with methylene blue as a guide for opening with the knife. (b) Dissection and removal of pyogenic membrane. (c) Method of closing wound. (d) Closure of skin and fascia with interrupted sutures.

as increase the amount of scar tissue. It is well known that malignant disease sometimes, in fact fairly often, arises in cicatricial tissue. Such a case recently came under my care.

The plan I adopt and prefer is excision with immediate suture. (Fig. 2.) This is not new by any means, as far back as 1777 it was resorted to by Lafaye in France. However, it may have been

in advance of the times, at any rate it fell into disuse, until revived in 1879 by Stephen Smith, of New York, who, you remember, died not long ago, aged nearly 100.

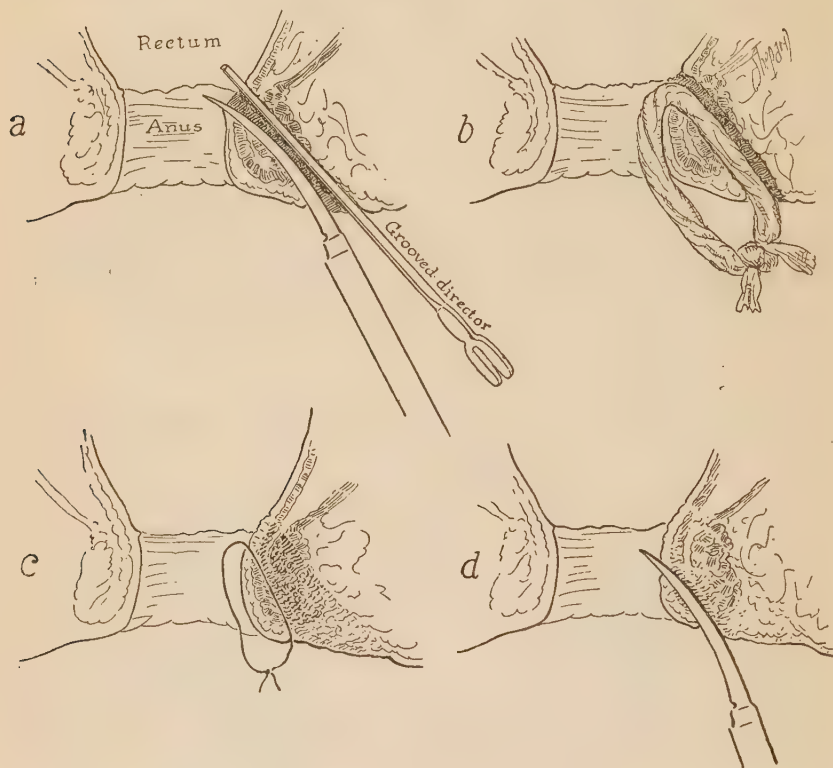
I usually proceed as follows: First I inject the fistula, if deemed necessary, with a solution of methyl blue (or other coloring materials) to aid in searching out the ramifications. Then pass a blunt-pointed director through the fistula (Fig. 2, *a*) and the end in the rectum may or may not be hooked out through anus. Next, either the tissues resting on the director are cut through and the pyogenic membrane dissected out (Fig. 2, *b*), or this membrane is dissected out, leaving it threaded on the director. (*Caution:* Use the probe with the utmost gentleness or you may make a false passage, thus defeating the very purpose of the operation.) After incising the intervening tissues and removing this pyogenic membrane, be careful to locate and remove any off-shoots or side-channels, since all diseased tissue must be got rid of and the wound thoroughly disinfected preparatory to closing.

We now proceed to suture the wound, being careful to control all bleeding, otherwise a hæmatoma may form and thus render our efforts naught, at any rate, greatly prolong the healing time. Occasionally this suture is very difficult. First, I usually close the incision in the mucosa from its termination within the bowel to the skin, with a continuous catgut suture (Fig. 2, *c*); next the severed sphincter or sphincters and the deeper tissues are united with interrupted buried catgut. Lastly, the skin and fascia are closed with interrupted silkworm-gut (Fig. 2, *d*). Once the wound is closed do not by any means attempt some of the "stunts" advised in books, such as pulling the mucosa down over the wound and stitching it to the skin, or covering the suture-line with collodion. We dress the wound with iodoform, or plain gauze, and apply a T-bandage. I generally give directions that the bowels be moved at the end of the third or fourth day with an enema of about twenty-four ounces of water, in which from 30 to 40 grains of inspissated oxgall have been dissolved.

Occasionally where this plan is not suitable I use my "seton method," which preserves the contour of the anus, as well as the muscular function of the sphincters. All the fistulous tracts external to the sphincter are divided. My probe-pointed director is then passed

into the bowel through the remaining tract and an incision made on its distal side (Fig. 3, *a*). This should extend far enough distally to divide part of the fibres of the external sphincter, and in such a direction as to locate the transferred internal opening at, or near, the proximal anal margin. Then, turning the knife, make an incision,

FIG. 3.



Seton method of treating anorectal fistulae. (*a*) Grooved director and knife *in situ*. (*b*) Seton loosely placed around all undivided tissues. (*c*) After management of seton. (*d*) The knife must now be used with great care as explained in the text.

the "back-cut" of Salmon, along the proximal side of tract. Now take a seton, pass it through the opening into the bowel, and tie it loosely around all tissues which remain undivided (Fig. 3, *b*). The wound is dressed as after the ordinary incision operation. In twenty-four to thirty-six hours it is redressed, care being taken in dressing it that the opening entering the bowel will be made to heal from the proximal toward the distal side. Later (one week or ten days) extend



the incision, under local anæsthesia, further distally. The object is to advance the final fistulous tract as far distally (or toward the skin) as the given case will permit; so it will, if possible, pass through distally to the fibres of the external sphincter when the skin is divided and the healing process is complete. As a rule, the enlarged tract entering the bowel soon closes, except that portion through which the seton passes. So soon as this has occurred the seton, if it is now only a small thread (Fig. 3, *c*), may be removed, and by the time the external wound has healed the tract entering the bowel possibly will have closed also. If not, at any time later this little tract (usually not an inch long) may be incised as in the anal fistula or dissected out and the remaining fibres of the muscle sewed together, thus preserving the functions of the sphincters.

By operating thus no deep sulcus is left to mutilate the anus as there frequently is following the usual plan of dividing the muscle. Instead of this the contour of the anus is preserved. Should the seton be left *in situ* until the wound is completely healed, a small non-secreting fistula will be seen entering the anal canal. This may be left alone or dissected out and sewed together at will; sometimes it will close without further intervention. Should the remaining tissues be divided (Fig. 3, *d*) without dissecting out the tract and sewing them together or making the famous "back-cut," mutilation of the contour of the anus and loss of control to a certain extent would most likely follow. In such a case the entire epidermis-lined tract should be dissected out and the ends of the muscle united. This may be done under local or general anæsthesia.

(Question by a visiting doctor) "Doctor, would it not be just as well, or even better, not to use the seton?"

No! By this means the opening into the bowel is transferred at the pleasure of the operator; or, in other words, with it we can direct and greatly control the healing process, as well as the location of the final fistulous tract. It might be objected theoretically that there could be constant reinfection from the setonized tract which would prevent healing. Practical experience has not shown this to be true; besides, the tract is washed out daily with some antiseptic solution. It is the consensus of opinion that the large majority of cases of incontinence following operations for fistula could be avoided if the

external sphincter were cut squarely across, and the ends sutured together; or the post-operative treatment directed so the ends of the muscles would be slightly separated by the cicatrix. My seton method provides for this procedure. The anal muscles not being divided at the first sitting aids the healing of the external wound, thus preventing much of the contraction usual after such operation. By operating in the manner described we simply have an external wound with which to contend. The anus is not disturbed to any great extent (and in some instances not at all), and the patient is usually up in a few days. Moreover, the bowel movements do not soil the wound.

## EXAMINATION OF THE FÆCES

By CHARLES J. DRUECK, M.D.

Professor of Diseases of the Rectum and Colon, Post-graduate Hospital  
and Medical School, Chicago

---

THE diagnostic value of the clinical analysis of fæces is not generally appreciated. Food in its passage through the digestive canal is reduced by various chemical and bacterial transformations until it is ultimately reduced to waste products destined to be eliminated from the system as useless or injurious. These final metabolic results together with other products of oxidation are, or should be, expelled from the body as fast as they are formed. The fecal mass voided differs widely in various individuals according to the character of the food and the form of habit in going to stool.

If the total evacuation is to be studied, the defecation should be passed into a warmed receptacle. If intestinal parasites are being sought, the examination must be made as promptly as possible because *Amæba coli* or *Trichomonades* can be diagnosed only by observing their characteristic movements, and these cease when the stools become cold. By means of a warm stage, however, these protozoa may be kept active for some time.

In routine examinations where a number of specimens are to be studied a saline should be administered before breakfast in order that several liquid stools may result. If a rectal speculum is introduced, a quantity of fæces sufficient for one examination may usually be obtained, or in diarrhœal conditions a small amount may be collected by means of a tube placed in the rectum for a few minutes.

*Composition of the Fæces.*—Fæces are derived from several sources:

(1) The unchanged residue of animal or vegetable tissues used as food, such as hairs, horny and elastic tissues, most of the celluloses, woody fibre, spiral vessels of vegetable cells and gum. Proteins are never found in the fæces with a moderate diet.

(2) Portions of digestible substances, especially when these have been taken in too large amount or when they have not been sufficiently

broken up by chewing, such as portions of muscular fibres, ham, tendon, cartilage, particles of fat, coagulated albumin, vegetable cells from potatoes and other vegetables, raw starch, etc. All foods yield a certain amount of residue, as, for example, white bread, 3.7; rice, 4.1; flesh, 4.7; potatoes, 9.4; cabbage, 14.9; yellow turnips, 20.7 per cent. Some fat is nearly always present in the fæces in the form of fatty acids, and to a small extent as calcium or magnesium soaps. The amount of fat found depends upon the amount of fat ingested and upon the amount of bile secreted.

(3) Products of intestinal secretion, namely, cholestrin, probably derived from bile, urobilin or stercobilin derived from the bilirubin (pigments) of the bile and other decomposed products of bile-pigments, which do not now yield the Gmelin reaction (nitric acid test) as well as the altered bile-acids, though the reaction may be obtained in pathological stools. Biliverdin, glycolic acid and taurocholic acid occur normally in meconium.

(4) After a milk-diet as well as a diet rich in fat, crystalline needles of calcium combined with fatty acids and chalk-soaps constantly occur, even in the suckling, and at times unchanged masses of casein and fat are found during a milk-diet.

(5) Among the inorganic residues soluble salts rarely occur in the fæces because they diffuse readily; among these may be mentioned common salt and other alkali chlorides, the compounds of phosphoric acid and some of those of sulphuric acid. Of the insoluble compounds, ammonia comagnesic, or triple phosphate, neutral calcic phosphate, yellow-colored lime salts, calcium carbonate and magnesium phosphate are the chief forms. Some of these insoluble substances are derived from the food, such as lime from bones, and in part, they are excreted after the food has been digested.

(6) The products of bacterial action comprise the entire series of fatty acids from acetic acid to palmitic acid, further, lactic acid, succinic acid, glutaric acid, leucin, tyrosin, hydroparacimaric acid, paraoxyphenylactic acid, phenylpropionic acid, phenylacetic acid, phenol, paracuosol, indol, skatol, skatol-carbonic acid, ammonium carbonate, ammonium sulphite and conjugate glucoronates.

(7) Microörganisms, the *Bacillus coli communis* predominating, are present in great quantities, and often make up a considerable



portion of the total fecal solids. There are also found parasites and their ova.

(8) Mucus, detritus and epithelial cells. These cylindrical cells of the mucous membrane are sometimes almost intact. Blood, pus, gall-stones, etc., are also sometimes found.

(9) Purin bases—guanine and adenine—which come directly from the food and also from the metabolism of the tissues. These are increased on a diet rich in purins (meat extracts and thymus), but are also found to be present on a milk-diet.

(10) The consistency of the fæces varies with their water content, which fluctuates between 68 and 82 per cent. It depends less on the water drank than on the vigor of intestinal peristalsis, the tone of the intestinal vessels and the state of the intestinal epithelium.

*Gases.*—Gases developed within the digestive canal, fermentation and putrefactive activities of the bacteria within the intestine together with the air swallowed with the food and saliva, are important factors in the process of formation of the fæces. As this development of gases is due to decomposition of the foodstuffs, it follows that quantity and kind of gaseous mixture vary with the nature of the diet.

Oxygen of the swallowed air is rapidly absorbed by the blood through the mucous membrane of the stomach, and is absent from the intestinal canal. Carbonic acid from the blood is also given up into the air of the stomach and partially mixes with the duodenal gases. Ruge analyzed the intestinal gases of man, as given off *per anum*, as follows:

Gas	Milk-diet	Flesh-diet	Vegetable Diet
CO <sub>2</sub>	16.8	13.6	34.
CH <sub>4</sub>	0.9	37.4	44.5
H <sub>2</sub>	43.3	3.	2.3
N <sub>2</sub>	38.3	45.9	19.1

Carbonic acid occurs in large quantities especially after a vegetable diet by (a) cleavage of carbonates, lactates, acetates and citrates; (b) alcoholic fermentations of glucose; (c) butyric fermentation of lactic acid; and (d) diffusion from the capillaries of the mucous membrane of the intestines.

The hydrogen so abundant on a milk-diet is due to butyric fermentation of lactic acid. Methane, which is developed after a diet of meat and vegetables, originates in the decomposition of acetates and lactates and of cellulose. Nitrogen is always present, though it varies much in quantity with different diets.

*Quantity of Fæces.*—There is a wide variation in the daily quantity of fæces eliminated, depending on the amount and kind of food ingested. Numerous attempts have been made to find the average composition of fæces from a diet containing just enough protein, fat and carbohydrates to keep the body in normal condition. Subjects to be tested should be placed upon this test for at least forty-eight hours before a specimen is taken. The following is the diet of Schmidt:

*Breakfast:* Half a litre of milk and 50 grams of crackers.

*Lunch* (mid-forenoon): Half a litre of oatmeal gruel consisting of 40 grams of oatmeal, 10 grams of butter, 200 grams of milk, 300 grams of water and one egg, all of which are to be strained.

*Dinner:* 125 grams of chopped meat lightly cooked, 20 grams of butter, 250 grams of mashed potatoes, containing 10 grams of butter and 100 grams of milk.

*Lunch* (mid-afternoon): Same as breakfast.

*Supper:* Same as mid-forenoon lunch.

Even during an absolute fast a considerable amount of fecal matter is formed in man.<sup>1</sup> Human fæces in fasting are yellowish-brown balls, of medium consistency, with little odor, and resemble the fæces of a flesh-diet. Upon a flesh-diet the fæces are small in amount (140 grams), and dark in color, while upon an exclusively vegetable diet they are the largest, amounting to 500 grams. On a mixed diet the fæces of twenty-four hours weigh about 170 to 200 grams.

Vegetable foods are much richer in substances indigestible or difficult of digestion so that larger quantities are taken to satisfy the needs of man, and a larger residue is left in the intestine. An excess of diet alters the amount of fæces. A superabundant meal, although it consists wholly of digestible substance, leaves more excreta because part of the meal escapes the action of the digestive enzymes and fails to come in contact with the absorbing surface of the intestine. On a mixed diet one-seventh to one-eighth of the ingested food is normally excreted.

---

<sup>1</sup> Fr. Müller, *Zeitschrift f. Biol.*, xx, 1884.

Piansnitz<sup>2</sup> concludes that human fæces with a few exceptions consist chiefly of excretory products of the intestine and not of the alimentary residues. The quantity of fæces depends principally on the nature of the food, some kinds requiring more *succus entericus* for their digestion than others. It seems more accurate to differentiate foods into those which cause the production of much or little fæces than to speak of foods which can be more or less assimilated. Stieh (1853) was the first to note that fecal matters contain substances which have a toxic action on the living body. The unquestionable therapeutic value of purgative waters is due to their exciting the excretory function of the intestine.

*Consistency and Form of Fæces.*—The normal pasty or dough-like character of the human stools molded to the shape of the bowel as long sausage-shaped segments or as a series of boluses closely massed together is dependent upon the amount of water present. A semi-fluid stool may be normal if the diet is largely vegetable. A vegetable diet containing 80 to 85 per cent. of water affords a much softer fæces than a proteid diet containing 60 to 65 per cent. of water.

Very liquid stools produced by laxatives are, of course, abnormal. Such diarrhœal movements often stratify themselves, liquid constituents above and solid food below, but care must be taken that the upper layer is not urine. A very hard stool (scybold stool) indicates an abnormally long residue in the colon and excessive absorption of its water until the mass is evacuated as small balls resembling sheep dung, and is due to tightly packed fecal matter becoming friable. A large quantity of fæces may stagnate in the rectum and distend it enormously. The lead-pencil or pellet-formed stool, popularly supposed to be due to rectal stricture, really indicates a spastic condition of the colon or a tight sphincter. Stricture of the bowel, unless situated in the anal canal, may be accompanied by a normal stool.

*Frequency of Movements.*—Even among healthy individuals there is considerable variation in the frequency of bowel evacuations. Some people have several bowel movements each day, and others, apparently just as well and comfortable, have but one movement in two or three days. There is no sharp distinction between what may

---

<sup>2</sup> *Zeitschrift f. Biol.*, xxxv, 1897.

be considered physiological and that which is pathological. The less frequent the evacuation the larger the amount eliminated at one sitting. Persons whose bowels move but once in several days will eliminate incredible amounts at a time; as much as a half-peck has even been recorded.

Constipation refers to infrequent movements which are not in proportion to the amount of food taken and in which the bolus is eliminated with difficulty. Constipation may be associated with various chronic digestive disturbances, *i.e.*, gastric dilatation and intestinal obstruction, and is also an independent disease due to one or more of several conditions.

*Diarrhœa.*—In diarrhœa, due to disease of the lower bowel, the individual movements are not large, but very frequent, due to the continual reflex tenesmus.

*Odor of the Fæces.*—The obnoxious odor of human fæces is largely due to indol and skatol, products of albuminous decomposition, but made more disagreeable by methyl mercaptan, hydrogen sulphide and methane.

*Reaction of the Fæces.*—The fæces are normally acid in reaction as a result of the acid fermentation of the lactic-acid bacteria which decomposes the carbohydrate foods; hence the acidity is greatest on a diet rich in starchy and saccharine substances. A neutral reaction of the fæces may occur on a diet rich in proteins, and is due to the development of ammonia or the abundant secretion of mucus.

*Color of Fæces.*—The color of the fæces varies considerable according to the nature of the food partaken. Contrary to the general opinion the bile-pigments have little influence on the normal color of the dejecta. The stools of infants are normally light yellow because they contain unaltered bilirubin. In adult life the fæces differ in color somewhat according to the nature of the food but on a normal mixed diet they are of a light-brown or dark-brown color. On a milk-diet the stools are light in color. On a diet rich in fat they are yellow or clay colored. On an exclusive flesh-diet, owing to the presence of hematin and ferrous sulphide, the fæces are blackish, due to the action of sulphuretted hydrogen, which is always present in the bowel, on the organic compounds of iron contained in the food or in the secretions of the alimentary canal. The fæces may be given



a blood-red color by raspberries, blueberries, blackberries and black cherries, or even by an abundance of red wine. Food rich in chlorophyll (green vegetables) produce green or olive-colored fæces. Starches tend to produce a yellow color. Drugs may affect the color of the fæces. Santonin, rhubarb and senna produce a yellow-colored stool. Hematoxylin produces a red-colored stool resembling blood. Calomel produces a greenish tinge, owing to its antiseptic action, which prevents the breaking of the bile-pigment into urobilin and also by the sublimate derived from the calomel, which changes bilirubin into biliverdin. Blood in the stool, unless fresh, always gives it a dark appearance, the so-called "tarry stool" due to the formation of hematin. Bismuth, iron and manganese produce a dark-brown or black-colored stool due to the formation of sulphides of the metals; a tarry stool which can be differentiated from the bloody (hematin) stool only by a chemical analysis. Methylene blue given internally renders the fæces blue when evacuated, but within a few minutes they change to bluish-green.

#### MACROSCOPIC EXAMINATION OF THE FÆCES

Many constituents may be observed macroscopically in the fæces, such as undigested particles of foods, skins of berries, large pieces of connective tissue, woody vegetable fibre, and undigested pieces of apples, pears, potatoes, grains of corn, flakes of casein, and tomatoes. Various stony substances frequently appear in the stools.

Gall-stones may be found following an attack of biliary colic or even without this association. They are important as an aid to diagnosis and should be carefully sought for by mixing the fæces with water and then carefully washing it through a sieve. They are friable, yellow or brown, smooth or faceted, small as a pea or even as large as an egg, composed of bilirubin, calcium salts and cholestrin and show concentric layers when fractured. These examinations must carefully be continued during at least fourteen days after cessation of an attack of colic, or the stones may readily be overlooked because they are then frequently soft and clay colored. Real gall-stones are not to be confused with pseudogall-stones, woody bits of plants, apples or pear seeds. Concretions of fat or fatty soaps are frequently found after olive oil has been administered for cholelithiasis.

Pancreatic stones are sometimes found in the fæces although they are rare. They are small in size, never larger than a pea, colorless, irregular in shape, usually single, and are composed of calcium carbonate and calcium phosphate. Fecal concretions (intestinal stones or enteroliths) are undigested food particles impregnated with calcium and magnesium phosphate, and are very hard and may reach the size of a hen's egg. Small stones of this kind may play a part in appendicitis, but are rarely found in the fæces. Foreign bodies are sometimes swallowed and passed in the stools, a fact to remember when dealing with children, insane or hysterical persons.

Various animal parasites, vermes and insects may be found macroscopically in the fæces.

*Vermes (Worms).*—When examining for worms and ova the fæces should be carefully washed. A laxative or vermifuge may be necessary to bring out the worms or head of the tape-worm. The fæces should be examined microscopically for ova, making very thin spreads of the fecal matter on a slide and using a low-power lens. Most ova are oval in shape, yellow in color, average about 50 by 30  $\mu$  in size, possess a shell and a central protoplasm which may be granular, segmenting or containing embryos.

(1) Trematoda (flukes).

*Schistosomum hematobium.* The ovum is large (50 by 70  $\mu$ ).

It has a terminal and lateral spine on its shell.

(2) Cestoda (tape-worms).

(a) *Tænia solium* (pork tape-worm).

The worm itself may measure up to three metres. It is a flat worm with a scolex (head) and proglottides (segments); the scolex is smaller than the head of a pin, is pear-shaped, has four suckers and a circlet of hooks. The proglottides show terminal arborizations of the uterus. The cysticercus or larval form usually is found in the pig, but may develop in man. The diagnosis is made by the findings of segments or the ova in the fæces. The tape-worm may cause no symptoms in some individuals while in others it may excite dyspeptic and nervous symptoms and severe anæmia.

The ovum is small (30  $\mu$  in diameter), round and has a thick radially striated shell.

(b) *Tænia saginata* (beef tape-worm).

The worm may attain the length of four to seven metres. The scolex is the size of the head of a pin and has four sucking discs but no hooklets; the proglottides show a branched uterus. It usually causes less severe symptoms than the *Tænia solium*. The cysticercus

develops in beef and cannot develop in man. The ova are smaller than that of the *Tænia solium*.

(c) *Hymenolepis nana* (dwarf tape-worm).

The worm is one centimetre in length, the scolex is globular with four suckers and a crown of hooklets; the proglottides measure one-half millimetre at its widest part. It is diagnosed by finding its eggs in the fæces. It may produce severe abdominal and reflex nervous symptoms. The ovum measures 30 to 40  $\mu$  in diameter, is round and has threads between the inner and outer walls of the shell.

(3) Nematoda (round worms).

(a) *Ascaris lumbricoides* (stomach worm).

The worm is cylindrical, twenty to forty centimetres long, reddish-brown, male anal extremity curved like a hook with two spicules. The oral opening has three muscular lips with fine teeth. It may cause no symptoms or may cause digestive disturbances.

The ova are large (70 by 50  $\mu$ ). It has a thick shell with a rough mulberry-like albuminous envelope.

(b) *Oxyuris vermicularis* (pin-worm; seat-worm).

The worm is thread-like, one centimetre long, and white. The head is a small knob. The male tail end is rolled toward the ventral side. Diagnosis made by finding the worms in the fæces. They produce severe itching about the anus. The ovum measures 50 by 20  $\mu$ , is asymmetrical, having a bulge on one side; colorless thin shell, the protoplasm is granular or in various stages of embryonic development. The ova are not found in the fæces but rather in the folds around the anus.

(c) *Uncinaria duodenale* (old world hook-worm).

The worm measures twelve to eighteen millimetres long, is white or blotched with brown when containing blood. The buccal capsule has four hook-like teeth and a large mouth opening. It causes severe anæmia. The ovum measures 50 by 30  $\mu$ , is thin, with a colorless shell. The protoplasm is unsegmented or may divide into two, four or eight rounded segments.

(d) *Necator americanus* (American hook-worm).

This worm is smaller than the old world hook-worm, and the buccal capsule has semilunar lips, prominent dorsal median teeth and a smaller mouth opening. The ova are larger than the old world hook-worm ova.

(e) *Trichocephalus trichiuris* (whip-worm).

This worm measures forty to fifty centimetres in length. Its anterior portion is thread-like, resembling the thong of a whip. The posterior portion is thicker like the handle of a whip. It is seldom seen in the fæces. It usually causes no symptoms. The ovum measures 5 by 25  $\mu$ . It is deep yellow or brown in color and has a button-like projection at each end of a thick shell.

*Stools of an Infant.*—Within twenty-four hours after birth dark-brown or black meconium should be voided. The stool on a milk-diet

is uniform; of butter-like consistency and light yellow in color. Any variety from the typical milk-stool occurring in connection with illness of the infant is of great diagnostic and prognostic import. A cheesy stool in a normal healthy baby means nothing, showing only an excess of undigested casein and is no indication for change of diet or the exhibition of drugs, but should diarrhœa accompany or follow the appearance of these white lumpy stools, the indication is then clear to reduce the proteins and give barley water.

The following table is taken from Williams:

Appearance of Infant's Stool	Significance when Certain Symptoms Justify
1. Pink streak .....	Uric acid infarct contamination with urine.
2. White and cheesy .....	Undigested casein.
3. Gray .....	Obstruction, jaundice, excess of fat.
4. Green .....	Changed bile-pigment.
5. Curds—colic, with constipation .....	Proteins at fault.
With diarrhœa .....	Fats or sugar at fault.
6. Green—sour—diarrhœa .....	Malnutrition, severe intestinal inflammation.
7. Mucus .....	Enterocolitis.
8. Red .....	Blood from lower bowel.
9. Brown .....	Blood from upper bowel.

#### TECHNIC OF EXAMINING THE FÆCES

*Washing the Fæces.*—Place a small amount of fæces in a beaker, add water, stir, let settle and pour off the water. Repeat this washing several times. Examine for macroscopical substances.

*Protozoa.*—These are unicellular organisms, mobility being by pseudopodia or flagellæ and reproduction by simple division within the cyst. They play an important rôle in the etiology of intestinal diseases.

- (1) *Entamæba histolytica* causes amœbic dysentery.
- (2) *Entamæba coli* causes no symptoms but may be found in cases of diarrhœa.
- (3) *Entamæba tetragena* is often associated with *Trichomonas intestinalis* or other protozoa in cases of acute and chronic diarrhœa.
- (4) *Trichomonas intestinalis* and the *Lamblis intestinalis* are very mobile, darting about by means of flagellæ, and are about three times the size of red blood-corpuscles.
  - (a) The *Trichomonas intestinalis* is oval in form and has a cluster of flagellæ at the front of its body, and a tail process.
  - (b) *Lamblis intestinalis* is pear-shaped, with a suction cup at one end. It has three pairs of flagellæ and two tail threads.



*Microscopic Examination.*—(1) Place a small loopful of the fæces on a slide, press down, cover glass and examine with low-power and then with a high-power lens. Look for muscle fibres, vegetable cells, bacteria, crystals and fat. In examining for protozoa the fæces must be fresh, the spread on the slide very thin, and the slide kept on a warm stage in order to better observe the movements of the parasites. An entamba should not be diagnosed unless its mobility can be demonstrated. At rest it resembles a large epithelial cell.

(2) Add a drop of tincture of iodine to a loop of fæces. Starch-granules will stain blue if present.

(3) Add a drop of Sudan III to a loopful of fæces. Fat droplets stain red if present.

*Chemical Examination.*—*Test for occult blood.* Dissolve one gram of benzidin in about one-half dram of glacial acetic acid. Put one c.c. of fæces and five grams of dilute acetic acid in a test-tube and mix. If blood is present a blue or green coloration results.

If the fæces give a positive reaction, or if occult gastric or intestinal blood is suspected, the patient should be put on a meat-free diet for three days. If the reaction is then positive, one can definitely say that the blood is pathological.

Mucus (mucin), which normally coats the formed fæces, may be so greatly increased as to be a large part of the stool. Any visible amount of mucus in the fæces is abnormal. In diseased conditions it may be found as:

(a) Shreds, lumps or small flakes, somewhat homogeneous, and transparent, rich in cells and detritus of digestion, varying in amount from small portions to nearly pure mucus.

(b) Large amounts of mucus mixed with blood. In mucous colitis, evacuations may consist almost wholly of the mucus, which is whitish, ribbon-like or tube-like, and expelled with violent colicky pains. These long strands may be mistaken for tape-worms.

(c) Strips of tough, leathery mucus from the large bowel as in conditions of secretory neurosis.

*Blood.*—The stool may be red and tarry, may contain macroscopic blood or occult blood, the color of the fæces depending upon the amount and source of the blood.

Occult blood may at times occur in the fæces or it may be recognized macroscopically. In these latter instances the origin of the blood attracts our attention. Solid fæces streaked or coated with fresh blood indicates a hemorrhage from the pelvic bowel (hemorrhoids, fissure or ulcer), while solid fæces tinged throughout with blood would suggest hemorrhage high in the intestine or in the stomach. In liquid stools the higher the hemorrhage the more altered is the blood when voided because of decomposition and digestion. Hemorrhage from the stomach is black or tar-like when appearing in the stool. Typhoid hemorrhage may be distinctly red, as it is so promptly voided by a stool. Bloody serous liquid stools without real fæces being present suggest intussusception or malignant disease of the alimentary tract.

*Pus.*—Pus in the fæces is generally pathognomonic of ulceration. If any considerable amount of pus is seen it is due to a ruptured extra-intestinal abscess, to ulcerated carcinoma of the colon or rectum, or to dysentery. Small amounts of pus may be due to an ulcer or to catarrhal changes. Undigested lumps of casein may be mistaken for pus in a diarrhœal stool.

*Fat.*—An excess of fat in the fæces may occur in (1) increased peristalsis; (2) interference with the fat absorption in the small intestine due to (a) amyloid degeneration of the intestine, (b) tuberculosis of the intestine, (c) tabes mesenterica, (d) chronic tuberculous peritonitis, (e) cancer of the intestine; (3) biliary obstruction; (4) pancreatic disease.

A clay-like stool usually contains fat droplets and large masses of fatty acid crystals.

*Microscopic Examination.*—When the material for examination is tenacious, such as the bloody mucus in cases of mucous colitis or amœbic dysentery or the muco-pus of tuberculosis, it can be transferred to a glass slide with a tracing needle; if watery, it can be drawn up into a small glass pipette and a drop or two placed on a glass slide and a cover glass placed over it.

Spreads which are to be stained are prepared and fixed similarly to a sputum examination.

*Crystals.*—Various crystals may be found among the fecal matter although but a few have any significance:

- (1) Fatty acids and soaps appear as slender needle-like crystals;
- (2) Triple phosphate crystals are common;
- (3) Calcium oxalate crystals—characteristic octahedral forms;
- (4) Charcot-Leyden crystals—these strongly suggest the presence of intestinal parasites;
- (5) Hematoidin crystals: yellowish or brown needle-like or rhombic shapes;
- (6) Bismuth suboxide crystals appear after the administration of bismuth salts.

*Bacteria.*—There are many varieties of microorganisms found in the fæces, some of which are normal inhabitants while others are abnormal.

#### PHYSIOLOGICAL FLORA

- (1) Yeasts are often present in a normal stool; molds are rare.
- (2) *Bacillus coli communis*.
- (3) *Bacillus lactis aërogenes*.
- (4) *Bacillus bifidus* (found in suckling infants); these are of bacillus alkaligenes and proteus group.

#### PATHOLOGICAL FLORA

- (1) Blastomycetes found in the stools of patients suffering with systemic infection.
  - (2) *Sarcinæ*, often found in cases of dilated stomach and diarrhœas.
  - (3) *Bacillus pyocyaneus*.
  - (4) *Bacillus aërogenes capsulatus*.
  - (5) *Bacillus tetani*.
  - (6) *Staphylococci*.
  - (7) *Streptococci*.
  - (8) *Bacillus tuberculosis*.
  - (9) *Bacillus typhosus*.
  - (10) *Spirillum choloræ asiaticæ* (coma bacillus).
  - (11) *Bacillus Shiga*—these organisms are the cause of bacillary or infectious dysentery.
- (a) Shiga type; ferments glucose only.

(b) Flexnor-Harris type; ferments glucose, mannite and dextrin, but not glucose (this is the type which prevails in the United States).

(c) Bacillus "Y" (Hiss and Russell; ferments only glucose and mannite).

In examining for bacteria, shreds of mucus are teased out and spread on the slide after which they are treated the same as when examining sputum.

#### TUMOR FRAGMENTS

Small adenoma or pieces of tumors may be torn off from cancers or ulcers in the rectum, sigmoid or colon and be found in the fæces. They are hard to recognize but may be large enough to wash and diagnose with a freezing microtome.



# Industrial Medicine

"The strongest bond of human sympathy outside of the family relation should be one uniting all working people of all nations and tongues and kindreds."  
—ABRAHAM LINCOLN.

---

## MEDICAL ASPECTS OF WORKMEN'S COMPENSATION LAWS

By FRANK L. RECTOR, B.S., M.D.

Secretary, Conference Board of Physicians in Industry,  
New York, N. Y.

---

PRACTICALLY every case arising under workmen's compensation laws involves medical questions either immediately or ultimately. Frequently the injury is not of sufficient duration to necessitate the payment of compensation and the medical service rendered comprises the limits of expense in the case.

For this and other reasons that will appear in the further discussion of this question it is evident that medical problems in the administration of these laws are of major importance and in many of the states should be given greater recognition than is now the case.

The laws now in effect in forty-two states—Arkansas, Florida, Mississippi, Missouri, North and South Carolina having no such laws at this time—provide for such medical, surgical and hospital service as may be necessary to relieve and cure the injury. In some states a limit is placed on the time this service is to be rendered, while in others this time is unlimited. The tendency in 1924 seems to be to remove limitations regarding medical service both as to time and amount as it is being recognized more and more clearly by industrial commissions, insurance companies and employers that unlimited medical service of the best quality is cheapest in the end. It reduces disability periods with a corresponding reduction in the amount of compensation paid.

### PERSONNEL

The majority of the states make no provision for medical representation on the board or commission that administers the compensation law. In only fifteen states (California, Illinois, Iowa,

Kentucky, Maryland, Massachusetts, Nevada, New York, North Dakota, Ohio, Oklahoma, Oregon, Virginia, Washington, West Virginia) is a physician attached to the industrial board or commission in the capacity of medical director or medical adviser.

In general the duties of these medical advisers are to make examinations of claimants in disputed cases, to pass on medical bills submitted for services, and to advise the board members on any questions coming before them involving a medical problem. With the exception of the state of Washington, none of the medical directors or advisers has administrative power. They can only express their opinion and make recommendations, final determinations being left to the board members. Seven of these fifteen medical advisers are on a part-time service only, and in at least one state the physician occupying this position is paid on a fee basis. With the exception of the above functions these physicians have no voice in the administration of the laws, regardless of the fact that the medical questions involved are oftentimes the major questions with which the commissions and boards have to deal. Such questions as the percentage of disability resulting from a permanent injury, the incapacity for work resulting from such injuries, the type of treatment rendered such persons and others of a similar character are presented in practically every case coming before the boards for consideration and are decided by non-medical men.

Practically all the industrial boards and commissions have the right to appoint a properly qualified physician to make an examination of the claimant and report his findings to the board. These are known as examining or impartial physicians. They usually have no continuity of service and receive fees of five or ten dollars and traveling expenses for each examination. Their duties are to make physical examinations of claimants under the law, ascertain the degree of disability from which they are suffering and report to the board their findings. These examining physicians are frequently called on when questions are in dispute and, inasmuch as they are under no obligations to either interested party, their findings are accepted by the board in preference to those submitted by the parties to the dispute.

## FEES

The question of medical fees is one that has caused much controversy and opposition from the medical profession in the administration of these laws. Thirteen of the states have adopted official fee schedules to guide them in the payment of bills for medical service.

In other states the physician's fees are subject to the approval of the commission and in still other states disputes as to reasonableness of fees may be referred to the board for settlement.

Comparison of the official medical fee schedules shows in some cases a wide variation in the amount allowed. For instance, for a single herniotomy California allows \$40, and Utah, \$100. For a laparotomy West Virginia allows \$75, and Utah, \$200. For a dislocated shoulder Nebraska allows \$20, and South Dakota, \$40. For a fractured humerus California allows \$40, and Utah, \$75. For removing a foreign body embedded in the cornea Nebraska allows \$2, and Nevada, \$10. Other variations of a similar kind are noted throughout these official schedules.

In an attempt to regulate the question of fees, fourteen of the states have provisions in the laws that "the pecuniary liability of the employer for the medical, surgical or hospital service herein required shall be limited to such charges as prevail in the same community for similar treatment of injured persons of like standards of living." The law in Texas requires the industrial board to consider the increased security of payment afforded by the act when considering medical fees.

The question of supervision of fees has caused contrary rulings in states under the following conditions. When the surgeon in charge of a free hospital ward has treated an injured person in the ward and thereafter presented his bill for payment, such payment has been denied in Pennsylvania and Massachusetts on the theory that if an injured person not entitled to compensation was placed in such a ward, the surgeon would give his services without charge the same as for other ward patients. The Maine commission, however, has ruled that the compensation law in that state makes no discrimination of this kind and in a contested case on the above

*Official Medical Fee Schedules—Workmen's Compensation Laws\**

GENERAL ITEMS	Cali- for- nia	Colo- rado	Idaho	Mary- land	Neb- raska	Nev- ada	North Dac- kota	Ohio	Ore- gon	South Dac- kota	Utah	Wash- ington	West Vir- ginia
First visit.....	2.50	3.00	5.00	.....	3.00	3.00	3.00	3.00	3.00	.....	5.00	3.00	3.00
{home.....	.....	2.00	2.50	.....	.....	2.50	2.50	3.00	2.50	.....	3.00	2.50	2.50
Subsequent visits {hospital.....	.....	1.50	1.50	.....	.....	2.50	1.50	2.00	1.50	2.00	.....	2.00	2.00
{office.....	.....	1.50	2.00	.....	1.50	2.00	1.50	1.50	1.50	2.00	.....	2.00	2.00
Mileage {day.....	.75	.60	.75	.50	1.00	1.00	.75	.....	.75	1.00	1.00	.75	.....
{night.....	1.00	.....	1.00	.....	.....	1.50	1.00	.....	1.00	1.50	.....	.....	.....
Assistant, major operation..	12.50	10.00	10.00	10.00	10.00	15.00	10.00	10.00	10.00	25.00	25.00	10.00	10.00
Assistant, minor operation..	6.00	5.00	5.00	2.00- 5.00	5.00	10.00	5.00	5.00	5.00	10.00	15.00	5.00	5.00
Anaesthetist, major opera- tion.....	10.00	5.00	10.00	5.00	10.00	10.00	10.00	10.00	10.00	10.00	.....	10.00	10.00
Anaesthetist, minor opera- tion.....	5.00	.....	5.00	.....	5.00	5.00	5.00	5.00	5.00	5.00	.....	5.00	5.00
Trained nurse, per day.....	.....	.....	.....	.....	.....	6.00	5.00	.....	5.00	.....	.....	5.00	.....
Hospital, ward charge per week.....	.....	15.75	.....	.....	.....	24.50	.....	.....	.....	.....	.....	18.00	.....
Hospital private room, charge per week.....	.....	.....	.....	5.00	.....	.....	.....	.....	.....	.....	.....	25.00	.....
Physical examination.....	40.00	50.00	.....	55.00	75.00	75.00	75.00	75.00	75.00	100.00	100.00	75.00	50.00
Herniotomy {single.....	.....	75.00	75.00	.....	.....	.....	110.00	100.00	110.00	100.00	200.00	110.00	.....
{double.....	.....	100.00	100.00	50.00	.....	.....	125.00	100.00	125.00	.....	.....	.....	75.00
Laparotomy.....	.....	.....	.....	50.00	.....	.....	100.00	.....	100.00	.....	150.00	100.00	.....
Laminectomy.....	100.00	.....	.....	50.00	150.00	100.00	100.00	.....	100.00	.....	100.00	100.00	.....
Decompression.....	60.00	.....	100.00	50.00	100.00	75.00	100.00	.....	100.00	100.00	150.00	100.00	100.00
Paracentesis.....	10.00- 25.00	.....	.....	10.00	.....	20.00	.....	.....	.....	.....	25.00	15.00	.....



DISLOCATIONS	Fees according to magnitude and time consumed.	10.00	5.00	10.00	10.00	10.00	10.00	10.00	25.00	25.00	10.00	.....
		.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mandible.....	.....	10.00	5.00	10.00	.....	10.00	10.00	10.00	25.00	25.00	10.00	.....
Clavicle.....	.....	.....	12.00	.....	.....	.....	.....	.....	.....	.....	25.00	.....
Shoulder.....	.....	25.00	25.00	20.00	.....	25.00	35.00	25.00	25.00	25.00	25.00	25.00
Elbow.....	.....	25.00	10.00	25.00	.....	25.00	50.00	50.00	40.00	25.00	25.00	25.00
Wrist.....	.....	15.00	7.00	15.00	.....	15.00	.....	.....	40.00	25.00	15.00	15.00
Finger.....	.....	5.00	3.50	5.00	.....	5.00	10.00	10.00	10.00	10.00	5.00	5.00
Hip.....	.....	45.00	25.00	45.00	20.00	45.00	50.00	50.00	75.00	100.00	45.00	45.00
Knee.....	.....	25.00	15.00	25.00	.....	25.00	50.00	50.00	40.00	100.00	25.00	25.00
Patella.....	.....	.....	7.00	5.00	.....	.....	.....	.....	.....	.....	.....	.....
Ankle.....	.....	25.00	15.00	20.00	.....	25.00	25.00	25.00	40.00	25.00	25.00	25.00
Toe.....	.....	5.00	3.50	5.00	.....	5.00	5.00	5.00	10.00	10.00	5.00	5.00
FRACTURES												
Nose.....	12.50	10.00	7.00	10.00	15.00	10.00	10.00	10.00	.....	25.00	10.00	10.00
Mandible.....	20.00	25.00	25.00	50.00	25.00	25.00	40.00	25.00	75.00	50.00	25.00	20.00
Clavicle.....	20.00	25.00	10.00	25.00	30.00	35.00	50.00	35.00	30.00	25.00	45.00	30.00
Scapula.....	20.00	40.00	15.00	30.00	25.00	40.00	40.00	40.00	40.00	25.00	35.00	25.00
Ribs.....	6.00	10.00	10.00	15.00	10.00	10.00	10.00	10.00	20.00	25.00	10.00	10.00
Humerus.....	40.00	50.00	40.00	50.00	50.00	50.00	75.00	50.00	50.00	50.00	75.00	45.00
Ulna.....	12.50	35.00	15.00	35.00	25.00	35.00	50.00	35.00	25.00	25.00	35.00	30.00
Radius.....	12.50	35.00	15.00	35.00	25.00	35.00	50.00	35.00	25.00	25.00	35.00	30.00
Colles.....	30.00	35.00	20.00	35.00	35.00	35.00	.....	35.00	50.00	50.00	40.00	.....
Hand.....	7.50	15.00	5.00	15.00	15.00	15.00	15.00	15.00	15.00	25.00	20.00	10.00
Fingers.....	5.00	15.00	5.00	10.00	.....	35.00	15.00	15.00	10.00	.....	20.00	10.00
Pelvis.....	25.00	75.00	.....	100.00	35.00	70.00	.....	70.00	100.00	100.00	70.00	55.00
Femur.....	40.00	70.00	50.00	100.00	75.00	100.00	100.00	100.00	125.00	100.00	100.00	75.00
Patella.....	20.00	25.00	30.00	25.00	25.00	50.00	100.00	50.00	75.00	100.00	25.00	50.00
Tibia.....	12.50	50.00	20.00	50.00	40.00	50.00	50.00	50.00	50.00	50.00	40.00	40.00
Fibula.....	12.50	20.00	20.00	35.00	25.00	25.00	25.00	25.00	50.00	50.00	25.00	25.00
Potts.....	30.00	75.00	25.00	65.00	50.00	70.00	75.00	70.00	50.00	50.00	75.00	.....
Foot.....	7.50	20.00	5.00	25.00	15.00	20.00	15.00	20.00	15.00	25.00	20.00	20.00
Toe.....	5.00	10.00	5.00	10.00	.....	35.00	15.00	35.00	.....	.....	35.00	35.00
Compound.....	xxx	10.00	5.00	10.00	.....	10.00	15.00	15.00	10.00	.....	15.00	10.00
	xxx	xxx	x	x	xx	xxx	xxx	xxx	xxx	xx	x	.....

\* Research Report No. 61, National Industrial Conference Board.  
 x—Add 25 per cent. to schedule. xx—Add 30 per cent. to schedule. xxx—Add 50 per cent. to schedule.

Official Medical Fee Schedules—Women's Compensation Laws—Continued

	Cali- for- nia	Colo- rado	Idaho	Mary- land	Neb- raska	Nev- ada	North Da- kota	Ohio	Ore- gon	South Da- kota	Utah	Wash- ington	West Vir- ginia
<b>EYE</b>													
Enucleation.....	40.00	50.00	75.00	50.00	100.00	75.00	50.00	50.00	50.00	50.00	75.00	50.00	50.00
Iridectomy.....	.....	.....	25.00	.....	75.00	.....	75.00	50.00	75.00	.....	100.00	50.00	.....
Use of giant magnet.....	.....	.....	.....	.....	75.00	.....	75.00	15.00	75.00	.....	.....	.....	.....
Foreign body embedded in cornea.....	5.00	.....	5.00	.....	2.00	10.00	5.00	3.00	5.00	.....	3.00	3.00	.....
<b>X-RAY</b>													
Head.....	10.00	.....	10.00	5.00	10.00	6.00	10.00	10.00	10.00	15.00	.....	10.00	15.00
Chest.....	10.00	.....	10.00	5.00	10.00	.....	10.00	10.00	10.00	15.00	.....	7.50	15.00
Pelvis.....	10.00	.....	10.00	5.00	10.00	.....	7.50	10.00	7.50	15.00	.....	10.00	10.00
Extremity.....	5.00	.....	5.00	5.00	7.50	2.50	5.00	10.00	5.00	8.00- 10.00	.....	5.00	7.50
<b>AMPUTATIONS</b>													
Shoulder.....	50.00	70.00	100.00	50.00	100.00	75.00	100.00	75.00	100.00	100.00	100.00	75.00	60.00
Arm.....	30.00	50.00	50.00	30.00	75.00	45.00	50.00	75.00	50.00	75.00	75.00	50.00	.....
Forearm.....	30.00	50.00	50.00	30.00	75.00	45.00	50.00	75.00	50.00	75.00	75.00	50.00	45.00
Hand.....	30.00	50.00	50.00	30.00	75.00	45.00	50.00	75.00	50.00	50.00	75.00	50.00	45.00
Finger.....	7.50	20.00	25.00	10.00	10.00	15.00	25.00	25.00	25.00	15.00	25.00	20.00	10.00
Hip.....	100.00	100.00	150.00	75.00	125.00	100.00	150.00	150.00	150.00	125.00	150.00	125.00	80.00
Thigh.....	75.00	65.00	75.00	50.00	100.00	75.00	65.00	125.00	65.00	100.00	125.00	70.00	60.00
Leg.....	30.00	65.00	65.00	45.00	75.00	50.00	65.00	.....	65.00	75.00	75.00	60.00	45.00
Ankle.....	30.00	65.00	65.00	30.00	75.00	50.00	65.00	75.00	65.00	75.00	75.00	60.00	45.00
Foot.....	30.00	65.00	65.00	40.00	75.00	50.00	65.00	75.00	65.00	75.00	75.00	60.00	45.00
Toe.....	7.50	20.00	25.00	10.00	10.00	15.00	25.00	25.00	25.00	15.00	25.00	20.00	10.00

question decided in favor of the surgeon and ordered his bill paid. Quoting from the decision in the Pennsylvania case:

"Physicians and surgeons attached to a hospital staff seek out these places for experience and prestige. They render no separate bill to ward patients to whom they minister in their professional capacity and they can gain no right in a compensation case to depart from the ordinary and usual rule or custom of the hospital unless they can show in each particular case a contract of hiring. It is only by contract that an employer can become obligated to pay for such services under such circumstances." (*Yost v. Coxe Traveling Grate Co.*, Pennsylvania, Department of Labor and Industry. *Monthly Bulletin*, vol. 1, No. 2, p. 24.)

In the Maine case referred to the commission held:

"Nothing contemplated in the act requires any member of the staff of any hospital, public or private, to give his services to any injured employee or that the hospital shall make any sacrifice therefor.

"If the services are rendered an injured employee at a hospital by regular members of a hospital staff both the hospital and physician or surgeon rendering services are entitled to reasonable compensation for all services rendered.

"Injured employees entitled to compensation under the terms of the Maine Workmen's Compensation Act are in no sense to be considered as objects of charity or state aid. They are entitled by the terms of the Act to be furnished all necessary medicine, hospital and surgical treatment, according to the degree of injury, at the expense of the employer and at the expense of no other person or institution in this state." (*McClure v. American Woolen Co.* Maine Industrial Accident Commission, Sept. 22, 1920.)

#### CHOICE OF PHYSICIAN

In all but five states (Massachusetts, Ohio, Rhode Island, Utah, Washington), the employer is held liable for furnishing medical service to his injured workers and in one of these, Ohio, self-insuring employers are charged with this responsibility. In four of these five states the employee has the right to choose his own physician and in the other state, Utah, the injured employee may exercise this right except in cases where the employer has provided for medical attention by contract. In California the injured worker may have a change of physician upon request unless the employer is providing a hospital and staff that have been approved by the commission. In Wisconsin, the employer must submit a panel of physicians in the community from which the injured worker may choose the one that he wishes to attend him. This panel must contain three physicians, if that many are available in the immediate community, and in the city of Milwaukee, five.

It is recognized by the majority of commissions that free choice of physician on the part of the employee is not always advisable from the viewpoint of either the employer or employee. Where the choice of physician lies with employer a more competent selection is usually made as the employer will turn to one physician for the majority of his work, and by actual experience such a physician becomes expert in the treatment of industrial injuries.

If the employees choose the physician few of them will select the same man, and so the experience which accrues to one physician who sees all the injuries from a plant is spread among a variable number of men, no one of which sees enough such cases to enable him to grasp the industrial problems involved. Moreover, the employer has a direct economic interest in the case as he is responsible for the payment of compensation until recovery of the injured, and he is entitled to all reasonable means of hastening the recovery. The commissions and courts while upholding this position have also permitted the employee to select his own physician provided he pays him himself, thus relieving the employer of that responsibility.

In a recent decision in Minnesota (*Lading v. City of Duluth*, 190 N. W. 981) the court required the city of Duluth to pay the expenses of treating an accident to a policeman who had selected a physician to treat his injury while, at the same time, the city had a physician under contract for this purpose. In this case the court evidently read into the law something that was not there and permitted the policeman to receive the treatment from his family physician up to the legal limit of \$100 permitted by law.

Practically all the compensation laws provide that, in cases of emergency where the employer's physician is not readily accessible, the injured employee may select a physician to render necessary treatment. In some cases the physician so treating the case must relinquish it to the employer's physician when the latter becomes available but in a few of the states this is not permitted and the physician first treating the case, provided he is competent, is permitted to continue in attendance at the employer's expense.

#### MEDICAL SERVICE

Under the question of what is included under medical service, the majority of states specify that service must be rendered by a



physician or surgeon duly licensed to practise within the state. Wisconsin permits treatment by Christian Science if the employee so desires unless the employer has served notice that he will not be subject to that provision of the law. In Colorado an employee may obtain permission from the commission in a non-surgical case to procure any non-medical treatment recognized by the state as legal. As chiropractors and Christian Scientists are recognized under the Colorado law, employees are entitled to such service. In Connecticut a "Doctor of Medical Electricity" with a diploma from a school of Mechano-therapy was not recognized as a physician (*Carpelo v. National Iron Works, Connecticut*. "Compensation Decisions," vol. iii, p. 372.) In Massachusetts payment for services by a masseuse was denied (*In re Golden*, 132 N. E. 726.) In California a Chinese herb doctor could not collect for his services. (*Knock v. Reliance Gas Regulator, California*. "Industrial Accident Commission Decisions," vol. iv, p. 181.) In Massachusetts where a claim was presented for services rendered by a Christian Science practitioner whose treatment consisted solely of prayer, the board dismissed the claim holding that prayer is a charge on the employer only when rendered under that section of the compensation act which provides for payment of funeral expenses. (*Welsh v. Boston Elevated R. R. Weekly Underwriter*, vol. ci, No. 1, p. 31, July 5, 1919.)

#### MEDICINES AND SUPPLIES

On the question of medicines and supplies, the requirements of the states vary, some holding that in addition to medicines and hospital supplies, crutches, artificial members and other curative and helpful appliances shall be included. The Oregon law provides artificial limbs but stipulates that:

"Said artificial limb shall be and remain the property of the State of Oregon and shall be so stamped and identified that it cannot be sold by the possessor. The injured workman shall have the right to select such artificial limb or arm subject to the approval of the board or commission."

In passing, it might be of interest to state that the law in California provides that injuries to artificial members shall be compensated.

The law in Indiana provides that the attending physician or

industrial board shall be the judge as to what surgical, nursing and hospital services and supplies are necessary in any given case.

In general, necessary dental work is considered a part of the medical and surgical service offered to injured workers. However, while the California law specifies that compensation shall be paid for injuries to artificial members, the commission in that state refused an award for a set of artificial teeth damaged by injury, holding that the term "injury" as used in the act referred to injury to the physical structure of the body, and as the plate of false teeth was an item of personal property, it did not come under the provisions of the law. (*DeWitt v. California Highway Commission. California Industrial Accident Commission, "Decisions,"* vol. v, p. 140.)

#### PHYSICAL EXAMINATION

New Mexico is the only state having a compensation law which provides that workers seeking employment may be examined before being engaged. All of the states provide for physical examination of injured workers to enable the commission to decide the degree of incapacity resulting from the injury. In some states these examinations may be demanded only by the commission, while in other states the employer is given this right.

The enactment of workmen's compensation laws has been the greatest stimulating factor to the physical examination of workers when seeking employment. This practice is becoming more prevalent in industry and the recent nation-wide campaign for an annual physical examination of everybody will doubtless do much to stimulate other employers to undertake the work.

The prime object of physical examinations is to see that the worker does not attempt work for which he is unfitted, or in which he would be a danger to himself, to fellow workers or to property. The compensation laws in all but four states (Connecticut, Illinois, Kansas, Ohio) have not, as yet, recognized this principle sufficiently to permit the signing of a waiver of claims for damages due to the defect from which the person suffers at time of being employed. In Kansas and Ohio only blind workers can sign such waivers which apply only to those injuries which are the direct result of the blindness. In the other states having compensation laws but no

waiver clause the employer is charged with the injuries resulting from such defects as his workers may have.

#### NEGLIGENCE AND MALPRACTICE

In general, if an employee refuses to accept the medical treatment offered or is negligent in following up the treatment prescribed, his compensation is either suspended or forfeited.

As to the negligence or malpractice of a physician, the laws of Virginia and Georgia state that the employer shall not be liable for malpractice by a physician furnished by him but that the consequences of any such malpractice shall be deemed part of the injury resulting from the accident and compensated accordingly. The same principle has been held in Washington (*Ross v. Erickson Construction*. 155 Pacific 153), while the Oklahoma courts have decided that the employer was liable (*Booth and Flynn v. Cook*. 193 Pacific 36). In Wisconsin under malpractice cases the employee is entitled to his compensation and also may bring a civil action against the physician for malpractice.<sup>1</sup> Minnesota (*Viita v. Dolan*. 155 N. W. 1077) follows the Wisconsin rule while a Kansas decision holds that the remedy in such cases is not covered by the workmen's compensation act but lies in a civil suit for damages on the ground that the result of unskilled medical treatment does not arise out of or in the course of employment, but is chargeable directly to the person or persons directly responsible therefor. (*Ruth v. Witherspoon Englar Co.* 157 Pacific 403.) In a Kentucky case an employee selected and paid for his own physician who was negligent in the treatment. It was contended by the employer that he was not liable for this treatment, but the board held that inasmuch as the physician selected by the employee was duly licensed by state authority, improper treatment administered by such a physician would not deprive the employee of the right to compensation unless he was aware the treatment was improper. (*Wells v. Blue Grass Coal Corporation*. Kentucky Workmen's Compensation Board, "Leading Decisions," 3d Report, p. 5.)

#### PRIVILEGED COMMUNICATIONS

Compensation boards are permitted wide latitude in the manner of arriving at their decisions. As they have quasi-judicial powers

---

<sup>1</sup> Sec. 2394-25, par. 3 of the Wisconsin law.

and functions they operate under rules and methods largely of their own making. For this reason the universally accepted principle of privileged communication between physician and patient was abrogated or greatly modified in the enactment of workmen's compensation laws in many of the states. Testimony of physicians who examine or treat compensation cases is removed from the "privileged communication" class in either of two ways: (1) The law provides that any physician who examines or treats an injured worker may be required to testify as to the result thereof; (2) the laws of some states also contain the provision that in conducting hearings the commission shall not be bound by the common law or statutory rules of evidence, but may make its investigation in a manner best suited to bring out the facts and establish the rights of the parties to the controversy. In nine states the law specifically provides that any physician "who treats or who makes or who is present at any examination of an injured employee may be required to testify to any knowledge acquired by him in the course of such treatment or examination relative to the injury or disability arising therefrom."

The Kansas law stipulates that when the physician of the other interested party has not participated in the examination, the one so making the examination cannot testify as to his findings. In Massachusetts the impartial physician appointed by the board must furnish both interested parties with copies of his report.

#### ANATOMICAL DEFINITIONS

A provision in the compensation laws that has led to much confusion is that one specifying the anatomic limitations for dismemberment purposes. Under some of these laws the hand may extend from the wrist to the elbow; under others the arm may extend from the wrist to the shoulder, or from the elbow to the shoulder. The foot may extend to the knee, and the leg from the ankle or knee to the hip. In the law of only one state, West Virginia, are the true anatomic limitations of members specified. (For details of these provisions see Research Report No. 61, National Industrial Conference Board, New York, p. 102.) Many controversial questions have arisen over the percentage of disability resulting from the partial loss of a member. The New York Board has adopted a schedule of proportional allowances in the cases of loss of two or more digits as a guide



in the consideration of such injuries. This schedule is refined to a high degree, and in many cases the percentages are listed in tenths and hundredths of a per cent. The Appellate Court of that state has ruled, however, that this schedule must be used as a guide only, and that it cannot furnish the sole basis for the rendering of a decision as to a particular loss sustained. (*Bubniak v. Stewart and Sons*. 198 App. Div. 112.) All the laws contain definite schedules of the amount of compensation to be paid for the total loss of different members of the body. In interpreting these schedules the general rule has been to consider the loss of use of a member through injury as equivalent to the loss of such member. However, the Supreme Court of Maine has ruled to the contrary holding that loss meant physical loss, only. (*In re Merchants*. 106 Atlantic 117.)

There is less uniformity among commissions in determining the point at which amputation shall take place. In some states compensation is granted for the actual amount of tissue removed without consideration of the possibilities for function remaining in the stump. The surgical point of election is ignored in such cases so that, in order to save paying as much compensation as possible, the amputation will be made as near the site of injury as may be although a tender stump may be left that is practically useless for the fitting of an artificial member. By such means disability is frequently prolonged beyond what would have been the case had the amputation been made at the point most favorable for the use of an artificial member.

#### AUTOPSY

In only nine states (Alabama, California, Georgia, Indiana, Minnesota, Nebraska, Tennessee, Virginia and Wisconsin) is there statutory provision for autopsies following fatal accidents. In the majority of other states having compensation laws autopsies may be had by mutual agreement between the interested parties or upon order of the commission.

#### INJURY AND DISEASE

It is in the consideration of cases involving the question of disease resulting from the injury or the aggravation of a latent disease by the injury that the lack of medical opinion is most pronounced. From a study of the decisions of commissions and courts it is seen

that in many cases the decision is rendered in favor of the workmen regardless of the medical questions involved. In those cases the decision usually revolves around the phrase in the law as to whether it "arose out of and in the course of employment." Appendicitis has been compensated in some states and denied compensation under similar conditions in other states. Anthrax has been compensated as a personal injury by accident. The Appellate Court of New York has held in a case coming before it for consideration, before the law was amended to include occupational disease, "that the contracting of anthrax, consisting of the bite of the bacillus of anthrax, was an accidental injury within the meaning of the workmen's compensation law and that said injury arose out of and in the course of employment." (*Heirs v. Hull and Co.* 178 App. Div. 350.) The Pennsylvania Supreme Court in holding that compensation should be awarded for the death of a wool sorter as the result of infection with anthrax germs through a scratch in his neck said:

"Here the anthrax germ, a distinguishable entity, came into actual contact with the deceased, thus gaining an entrance into his body, and his neck began to swell and discolor; therefore, the complaint from which the claimant died can be traced to a certain time when there was a sudden or violent change in the condition of the physical structure of his body, just as though a serpent, concealed in the material on which he was working, had unexpectedly and suddenly bitten him." (*McCauley v. Imperial Woolen Co., et. al.*, 261 Pennsylvania 312.)

The Pennsylvania industrial board, in another case, however, denied compensation for anthrax, holding that as the language of their act expressly stated that injury and personal injury meant violence to the physical structure of the body and such disease and infection as naturally resulted therefrom, any disability resulting from germ infection which might have entered the body when no cut or wound was disclosed did not fall within the provisions of this act. (*Sawisky v. Robt. Foerderer, Inc.*, Pennsylvania. "Workmen's Compensation Board Decisions," vol. i, p. 27.)

Cases of erysipelas, influenza, pneumonia, typhoid fever, and also unusual cases of actinomycosis, diabetes, diphtheria, glanders, meningitis, scarlet fever, sciatica, smallpox, and others have been held compensable in some cases although other claims for compensation due to the same diseases have been disallowed. Practically all the claims for typhoid fever have arisen through the alleged contamina-

tion of drinking water furnished to employees. Wisconsin has furnished the leading case in the granting of compensation (*Vennen v. New Dells Lumber Co.* 154 N. W. 640), while a more recent decision in Ohio denied compensation because typhoid fever was not an injury within the meaning of the act in that state. (*Industrial Commission v. Cross.* 104 Ohio 561.)

Pneumonia has been compensated both as the result of exposure and following an injury. In Michigan, compensation for pneumonia was denied a fireman who became drenched while fighting a fire in winter weather. (*Landers v. City of Muskegon.* 163 N. W. 43.) Massachusetts, on the other hand, awarded compensation under similar conditions. (*In re McPhee.* 109 N. E. 633.)

The previous state of health of an injured worker is not a defense against liability in workmen's compensation cases. Inasmuch as the employer takes the workman as he finds him, he is liable for all the direct consequences of an injury or accident including the aggravation and acceleration of a preëxisting disease. This is the line of reasoning followed by all the states having compensation laws, with the exception of Kentucky and California. The law in these two states specifies that no compensation shall be paid for such parts of the disability as may be due to a preëxisting disease.

Malignant growths appearing at the site of an injury or adjacent thereto are generally regarded by industrial commissions as resulting from the injury, although clinical evidence is overwhelmingly opposed to this viewpoint. It is of interest to note that practically all industrial commissions and courts when considering injuries involving morbid or malignant growths refer to the condition as "cancer." There is little or no effort to differentiate true cancer from other growths, both benign and malignant. From the standpoint of etiology and treatment this differentiation is of importance, but from the compensation standpoint it is of secondary consideration as the results are the same in that the worker is incapacitated and thus entitled to compensation payments.

Infection and disability following compulsory vaccination by the board of health over the protest of the employer have been compensated as an accidental injury in Massachusetts (*In re Fewore.* Massachusetts Industrial Accident Board, "Workmen's Compensa-

tion Cases," vol. ii, p. 332), but under similar circumstances the Michigan courts have held an opposite opinion. (*Krout v. Hudson Co.* 166 N. W. 848.) Fatal infection following slight scratches whose treatment had been neglected has also been held compensable in a number of states.

#### EYE INJURIES

In no branch of compensation work is there more controversy and difference of opinion than in the consideration of eye injuries.

#### *Comparison of Snellen Chart Readings in Different Tables\**

(These readings are for visual acuity only.)

Snellen Chart Readings	Table Proposed by			
	American Medical Asso.	Dr. Chapman	Chicago Ophthal. Society	Minnesota Academy Ophthal.
20/ 20.....	0	0	0	0
20/ 30.....	2.5	5	5.5	10
20/ 40.....	5.	10	11.	20
20/ 50.....	7.5	15	16.5	25
20/ 60.....	10.	20	22.	33½
20/ 70.....	12.5	25	27.5	40
20/ 80.....	15.	30	33.	50
20/ 90.....	17.5	35	38.5	...
20/100.....	20.	40	44.	75
20/110.....	22.5	45	50.	...
20/120.....	25.	50	59.	85
20/130.....	27.5	55	63.5	...
20/140.....	30.	60	68.	...
20/150.....	32.5	65	71.5	...
20/160.....	35.	70	77.	...
20/170.....	37.5	75	81.5	...
20/180.....	40.	80	86.	...
20/190.....	42.5	85	88.	...
20/200.....	45.	90	90.	100
20/210.....	47.5	95	....	...
20/220.....	50.	100	....	...

\*Research Report No. 61, National Industrial Conference Board.

In this instance the difference of opinion is not confined to the commissions and courts but is participated in by the medical profession as well. There are recognized officially no less than five different tables of percentage loss of vision based upon Snellen readings. These tables are in agreement in only one item, 20/20 equals normal vision. Industrial blindness ranges in these tables from 20/100 to 20/220.

While New York has adopted no table, it has ruled officially



that 20/100 equals industrial blindness and that 20/40 is a reduction to 50 per cent. of normal vision. Also the law in this state provides that "compensation for loss of binocular vision or for 80 per centum or more of the vision of an eye shall be the same as for loss of the eye." In other tables 20/40 is listed at from 5 per cent. to 20 per cent. loss. In only one table, that of the American Medical Association, is notice taken of the three factors entering into vision, viz., visual acuity, peripheral vision and binocular single vision. The other tables consider visual acuity only.<sup>2</sup>

In considering eye injuries as well as injury to other members, the commissions and courts have rendered decisions as to the meaning of the phrase "loss or loss of use." Pennsylvania has held that loss meant physical loss, and has denied compensation for a marked reduction in vision, to 20/70, holding that the workman had not lost his eye. (*Cavalo v. Pennsylvania Coal Co.* Pennsylvania. "Workmen's Compensation Board Decisions," vol. iv, p. 207.) For total blindness or enucleation of the eye definite awards are made in all the laws. It is when estimating the degree of partial loss of vision that the greatest differences arise. Another interesting condition is that in which a one-eyed workman loses the sight in his remaining eye. In some states an award for permanent total disability is given, while in others the employer is held liable only for the injury occurring in his employ.

In Pennsylvania the board denied compensation for the enucleation of an eye which retained only the perception of light, holding in this case that there was no loss of an eye when it was already blind. (*Quinn v. Shipbuilding Co.* Pennsylvania. "Workmen's Compensation Board Decisions," vol. v, p. 462.)

#### HERNIA

Twelve states (Alabama, Colorado, Georgia, Idaho, Kentucky, Montana, New Jersey, New Mexico, Oregon, Texas, Virginia, West Virginia) have passed legislation defining the cardinal principles which must underlie an action for compensation for hernia. In general, proof is demanded of three things: (1) That there was an injury resulting in hernia; (2) that its appearance was sudden

---

<sup>2</sup> For details of these tables see Research Report No. 61, National Industrial Conference Board, New York, p. 206 *et seq.*

and accompanied by pain; (3) that the hernia immediately followed the accident and that it did not exist in any degree prior to the accident. The laws of five states (Alabama, Georgia, Oregon,

*Statutory Provisions Covering Hernia Compensation\**

State	Requirements	Miscellaneous Provisions
	(See below)	
Alabama.....	1-2-3-4-5-10	.....
Colorado.....	3-4-12	Operation fee \$50. ....
Georgia.....	1-2-3-4-5-10-11	.....
Idaho.....	1-2-4-5	.....
Kentucky.....	1-2-4-5-11	Operation provided with \$200 expense and twenty-six weeks' disability. Refusal of operation for physical reasons entitles to compensation during entire disability. Unreasonable refusal limits compensation to one year. ....
Montana.....	3-4-5-6-12	Operation fee \$50. ....
New Jersey.....	1-2-3-7-8-9-11	Refusal of operation entitles employee to cost of truss and twenty weeks' compensation. Operation entitles employee to \$150 medical expense and disability payments. ....
New Mexico.....	3-4-5-6-12	Operation fee \$75. ....
Oregon.....	4-5-10	Operation entitles employee to forty-two days' disability payments. Refusal of immediate operation bars all benefits under act. ....
Texas.....	1-2-3-4-5-11	Operation and twenty-six weeks' disability allowed. Refusal after board's physician finds employee fit for operation limits compensation payments to one year. ....
Virginia.....	1-2-3-4-5-10-11	.....
West Virginia....	1-2-3-4-5-10-11	.....

\* Research Report No. 61, National Industrial Conference Board.

**HERNIA—REQUIREMENTS FOR COMPENSATION**

- 1—That there was an injury resulting in hernia.
- 2—That the hernia appeared suddenly.
- 3—That it was accompanied by pain.
- 4—That the hernia immediately followed an accident.
- 5—That it did not exist prior to accident.
- 6—That hernia was of recent origin.
- 7—Such prostration that employee stopped work immediately.
- 8—Fact communicated to employer within twenty-four hours.
- 9—Distress so severe that doctor was called within twenty-four hours.
- 10—All hernia cases shall be treated in surgical manner by radical operation.  
No compensation during period of refusal of operation unless physical condition is such that an operation is considered unsafe.
- 11—Death resulting from operation compensated as death from injury.
- 12—Strangulation after refusal of operation is not compensable.

Virginia, West Virginia) are mandatory regarding treatment of hernia by radical operation, and the claimant must submit to such an operation in order to receive compensation, provided his physical

condition does not preclude such treatment. The Oregon law provides that a person must submit "forthwith" to radical operation for cure and in event of refusal neither he nor his beneficiaries are entitled to compensation benefits. The question of accidental injury in the causation of hernia is one under which conflicting decisions have arisen, but in the majority of cases compensation is granted.

The consideration of hernia as a preëxisting disease has been summed up in an Iowa decision as follows:

"The general compensation view has been and is that in cases where a workman has been performing the service of an able-bodied man and that something in connection with this service actually happens to break him down, promptly produces disability and makes operation necessary, the injury is held to arise out of and in the course of employment." (*Vanos v. Waterloo Gasoline Engine Co.* Iowa. "Workmen's Compensation Service," 3d Biennial Report, p. 40.)

The table on page 176 gives the provisions of the different compensation laws regarding the method for treating hernia claims.

#### OCCUPATIONAL DISEASE

From the beginning of workmen's compensation administration a broad distinction has been made between accidental injury and occupational disease. Accidental injury is considered an unforeseen, unexpected event occurring suddenly and under some laws requiring violence to the physical structure of the body, whereas an occupational disease is reasonably to be expected as a natural result of the hazards of employment and develops gradually. Four states (Illinois, Minnesota, New York, Ohio) have adopted schedules under which diseases considered as occupational may be compensated. In the laws of Minnesota and New York the phrase "or sequelæ" follows many of the diseases.

The inclusion of the phrase "or sequelæ" seems too inclusive as many conditions that have only a remote connection, or no connection with the original disease condition, but occurred after the first disease had run its course, may be set up as a claim for compensation under the plea that they were related to the original condition for which compensation had been paid previously.

In those states in which occupational diseases are not listed but for which compensation is paid (California, Connecticut, Massachusetts, Wisconsin), it is necessary to prove that the disease resulted from the occupation. As an illustration of this, an interesting case

is reported from California. A fifteen-year-old boy employed as a dairyman's helper complained of disability in his hip which was diagnosed as epiphyseal separation of the left femur due to innumerable jars caused by his jumping from a delivery truck. The injury was made possible by the incomplete ossification of the femur which was characteristic of a person of his age. (*Hurd v. Crown City Dairy Co. California Industrial Accident Commission, "Decisions,"* vol. viii, p. 215.)

#### GROUP PRACTICE

Before concluding this article a word should be said about the organization of groups of physicians for the furnishing of medical attention in compensation cases. In many of the western states it is frequently the case for industries located in isolated sections to furnish complete hospital equipment for the care of their employees. The workers are usually assessed \$1.00 per month, this assessment being collected whether the worker is sick or injured or not. In general these hospitals must meet certain minimum requirements of equipment and personnel before they are approved by the commission. In Seattle, Washington, the county medical society has established an industrial service bureau through which such members of the society as care to do so are able to treat compensation cases. The work is apportioned among those registered in an equitable manner and there are always physicians available at the central office for emergency calls into the factories. Through the operation of this bureau every injured workman has free choice of physician and in addition the consulting services of needed specialists without extra charge. It is said that this organization is unique and the only one of its kind in the United States. In other states certain physicians or groups of physicians equip themselves for doing industrial work and specialize in this type of service. Through contracts with employers and insurance companies they are enabled to develop organizations, some of which have become quite extensive and well known.

The operation of such dispensaries, in some respects, has been the cause of much criticism from other members of the medical profession. Political interference, unethical practices and inferior medical service have been charged against those who conduct these



clinics; on the other hand, it is said by those friendly to this type of work that these clinics are furnishing a service that is satisfactory alike to the injured workman and the employer or insurance carrier.

When considering the relation of the medical profession to the operation of workmen's compensation laws, it might be well to point out that the enactment of such laws introduced a new element into the relations of the physician to the community. These laws make mandatory the providing of medical, surgical and hospital service to injured workers. They also either directly limit the expense for which the employer is liable for such treatment or empower the administrative bodies to pass on all such fees. While the law stipulates that medical service shall be furnished by the employer, as a matter of course, this requires the services of a physician. This introduces a problem that has not heretofore been in evidence in the activities of the medical practitioner. Being the only one in the community capable of rendering such service, there is imposed upon him the duty of contributing from his skill and experience to the treatment of such cases; and as compensation for such treatment is definitely limited or restricted by law in many states it becomes necessary for the physician doing this work to readjust his conception of medical ethics to meet this new social obligation that is demanded of him.

#### SUMMARY AND CONCLUSION

The medical subjects touched upon in this paper are among the more important encountered in compensation work. There are others of equal importance but space does not permit of a discussion of them all. Interested readers are referred to Research Report No. 61, National Industrial Conference Board, New York, for more detailed discussions and illustrative cases, as in that report has been gathered the most information on this question that has yet been published.

From this survey of the medical provisions of the compensation laws and their administration, certain questions stand out as being in need of study by physicians, industrial commissions and legislatures. In view of the importance which attaches to the medical care of compensation cases, each administrative board should have as one of its members a properly qualified physician whose judgment and experience would command respect and who would have a voice with

the other commissioners in the decision of these cases. The qualifications of such a physician are realized by all. He should be free from political domination and should receive compensation in keeping with his ability and the responsibilities of his position. With proper consideration of the opinions of such a member there would not be the differences in board decisions and court opinions that are now so manifest. This would tend toward a greater uniformity in the administration of these laws, a thing that is highly desirable, particularly to those industries operating in more than one compensation jurisdiction. The present tendency of commissions is to decide the claim from the medical standpoint on the question of theoretical possibilities and along social lines rather than in the light of the results of practical medical experience with similar cases. It is realized that there is practically nothing impossible in the realm of medicine, but it is also recognized that many such possibilities seldom, if ever, occur.

An evidence of the non-participation of medical minds in the enactment and administration of these laws is seen in the lack of uniformity in the anatomical limitations for dismemberment purposes discussed on page 170, also the descriptive medical terms appearing in the decisions of commissions and courts.

When considering eye injuries there is much need for agreement, first, between different members of the medical profession, and next between the medical profession and the compensation commissions on the percentage of defect shown by different readings on the Snellen chart and other methods of measurement. Fortunately, this matter is now receiving some attention. The International Association of Industrial Accident Boards and Commissions has appointed a committee to meet with a similar committee from the medical profession for the purpose of developing a uniform standard for the estimation of visual defects following injury.

Another condition needing correction has a direct relation to medical problems of compensation laws. I have reference to statistical records of cases and decisions. Comparable records of the experience of the different boards is impossible to obtain, valuable as such information would be. In several of the states the legislatures have failed to appropriate sufficient funds to permit of any extended

analysis of the records accumulated in the administration of the law. For this reason, in the majority of instances, such improvements and amendments as have been made to the laws have been brought about by legislative intent rather than as the result of past experience. The records of these boards and commissions contain a wealth of material bearing on social and economic problems of great importance to industry and a comprehensive and practical analysis of such material would go far toward the solution of some of the more pressing problems in this work.

In conclusion, it must be recognized that workmen's compensation laws represent a relatively recent excursion into the field of social legislation, and like all new undertakings mistakes are bound to occur which lead to misunderstandings and injustices. The medical profession is called upon to lend assistance in this work in a way never before known and the physician must come to realize that whether or not he is satisfied with the present conditions, this type of law is here to stay and he must adjust himself to it. In order that this adjustment may be of the right kind and of not too radical a nature physicians should give careful thought to the questions involved and unite upon some program that will preserve their rights, conserve their interests, and, at the same time, offer justice and proper service to those with whom they have to deal. A more thorough study of the compensation laws and the principles underlying them is highly desirable for all physicians in order that they may understand the questions involved more from the social and economic standpoint than from the standpoint of the effect upon their individual experiences.

## INDUSTRIAL HEALTH SUPERVISION

By GEORGE M. PRICE, M.D.

Director, Union Health Centre, New York City

---

INDUSTRIAL efficiency is not an engineering problem alone. It is also a medical problem. The human factor in industry is more important than the mechanical and needs medical supervision surely no less than the mechanical parts need engineering supervision.

Medical supervision is necessary in all trades and all industrial establishments. It is especially imperative in what are called "dangerous trades." By these are meant all trades where there are poisons, gases, fumes, or infections to be found, either due to materials or to the industrial processes. Medical supervision must begin in dangerous trades and be extended later to all industries alike.

There are two forms of medical supervision of dangerous trades:

(1) By states; and (2) by individual owners of factories.

State medical supervision of factories has not as yet become a fundamental part of factory legislation except in a very few countries and states. The only European countries in which state medical factory supervision is an established fact are England and Belgium. There is very little medical supervision in other European countries except so far that we may here and there find a medical man in the factory inspection department of the state. England has a section of medical inspection attached to the factory department, consisting of a chief inspector, with four assistants; and has also over twenty-five hundred certifying surgeons, who may be called medical supervisors of factories, in that their functions are (1) certification of minors for permission to work; (2) investigation of industrial accidents; and (3) reporting and investigation of occupational diseases.

In Belgium a similar system is in practice, there being a chief medical factory inspector with three assistants and several hundred *medicines aggrégés*, whose functions are similar to those of the certifying surgeons except that they do not certify the children for admission to factories but pay more attention to occupational diseases and to first-aid facilities in factories.



In the United States, medical factory inspection is confined only to the states of New York, New Jersey, Illinois, Massachusetts and Pennsylvania, New York State having been the first where a medical factory inspector was appointed.

These attempts at medical supervision of factories are still, however, very crude, desultory, insufficient and inadequate. A proper state medical supervision of factories means much more than the simple appointment of one or more medical factory inspectors attached to the factory inspection department. It means a thorough, comprehensive supervision of every industrial process or establishment which may be included under the designation of dangerous trades. Such a supervision is evidently impossible with the very small force usually found in the inspection departments.

There is really no reason whatever why industry and the captains of industry should wait for the state to establish a compulsory medical supervision of factories. They should do it themselves. Indeed, it is pleasing to note that a great many large corporations and industrial establishments have already established a medical supervision of their own and a great many others are on the eve of such a work.

Because the present tendency in industry is to establish medical supervision and because so many large factories and industrial establishments are contemplating such work, it is timely to discuss the purpose of medical factory inspection, qualifications of medical supervisors, and to define their functions.

The purpose of medical supervision in industries is to conserve the human factor in industry, to preserve the health of the workers, to prevent occupational diseases, and consequently to increase industrial and human efficiency.

The two most important qualifications besides medical education, necessary for a medical supervisor in dangerous trades, are: (1) A knowledge and thorough training in industrial hygiene and (2) a social viewpoint.

The medical supervisor in a factory is intimately connected not only with the personnel of the industrial plant, but also with the sanitation, the technic and the special industrial and mechanical processes therein. Unless he has a thorough knowledge of the indus-

trial processes with which the workers in the shop come in contact, and unless he is cognizant of the particular dangerous materials and processes within the establishment, his work in prophylaxis will be nullified.

He should also have a knowledge of sanitation of industrial plants and not be like the physician of a large lead plant in New York, who didn't know whether there was hot water in the plant or not.

Unfortunately, our medical colleges have not as yet included in their curriculum a study of occupational diseases and of industrial hygiene; and we cannot blame the physicians who are engaged as medical supervisors for their lack of technical knowledge of industrial conditions.

The second important qualification which I have mentioned I consider of great importance. The physician appointed as medical supervisor in a factory must have the proper social viewpoint. I do not mean by this that he should be a socialist or a member of a labor organization, but he should be imbued with the principle of industrial justice and should not regard the worker, whether native or foreign, as an inferior being—as a “wop,” a “hunk,” a “polak.” In my investigation of a large number of factories, I have met physicians attached to the factories whose regard for workers was so contemptuous that their work of the medical supervision cannot be of value.

As to the functions of the medical supervisor, these may be summarized as follows:

1. Sanitary supervision of the plant.
2. Technical prophylactic supervision of the dangerous processes.
3. Preliminary examination of all applicants for work in the factory.
4. Periodical examination of all factory workers.
5. First-aid and treatment.
6. Medical supervision of health of the workers.
7. Educational work.

By sanitary supervision of the plant I mean a general supervision of the sanitary aspects of the factory: Its light, ventilation, dust removal, the drinking, washing and bathing facilities, the methods of disposal of refuse, rubbish and dirt, as well as sewage and factory waste; and the construction, maintenance and condition of the toilet and other similar matters. A sanitary supervision involves not only

a general inspection but also a daily routine examination into all these sanitary aspects of the factory.

The technical prophylactic supervision of dangerous processes is absolutely indispensable if the medical supervisor of a factory in a dangerous trade is to consider his work of practical value. There are many toxic and other materials which may readily be substituted by others less dangerous; there are a number of processes which, after proper study, may be simplified and changed so as to lessen dangers to life and health; and there are many technical points in industrial control that are of great importance to prophylaxis. The engineer, the superintendent, the foreman, have for their functions the improvement of the mechanical processes, the increase of industrial efficiency and a corresponding increase in production. The health of the workers and the prevention of diseases is no function of theirs. Hence, there should be someone in the plant who should be intimately acquainted with all the mechanical and industrial processes in the establishment and who should supervise these processes with the sole and only purpose to lessen their dangers to health and to prevent occupational diseases.

It is unnecessary to dwell upon the imperative need of giving a thorough physical examination to every applicant for work in a dangerous trade. The engineer or technical supervisor of the plant will not for a moment think it advisable to accept a new machine in the plant which has not been previously tested as to its construction, etc., and which has not undergone a thorough test and scrutiny. Why the same practice should not apply to every new worker in the factory is difficult to understand. There are persons who should not be admitted into a factory where particularly dangerous processes are carried on or dangerous materials are handled. Therefore, the preliminary medical examination should be a routine practice of the medical supervisor and should be done thoroughly and scientifically.

A periodical examination of every worker in the plant is another practice, the necessity of which needs no explanation. The question is only how often these periodical examinations ought to be made. Professor Teleky thinks that in lead trades a biweekly examination is necessary. In some plants this examination is made at too long intervals. Workers in very dangerous processes should be examined

at least once a month, if not every two weeks. This, of course, aside from the fact that all workers should be instructed to present themselves to the physician at the slightest symptoms of sickness. During his periodical examination it is possible for the medical supervisor to recognize the first symptoms of lead and other poisoning and to prevent further progress of the disease by changing the work of the employee or by giving him a rest from certain dangerous processes.

The medical supervisor in a factory should also have charge of the first-aid facilities in the shop. Such first-aid facilities should be appropriate to the character of the dangerous materials handled and processes carried on within the shop and should contain not only the various apparatus for resuscitation and first-aid treatment for injuries, etc., but also such neutralization materials and special prophylactic medicaments that may be appropriate for each special factory.

The supervision of the health of the workers should not be limited to the functions mentioned, but should be extended to a general supervision of the health of the worker, whether within or outside the factory—to nutrition, clothing, housing, etc.—so that the physician may be able to come in contact with the worker even outside the shop, to recognize the elements of danger in his sanitary surroundings and to give him proper advice which would lead to the preservation of his health.

With the above-named functions, however, the work of the medical supervisor in a dangerous trade is as yet not exhausted.

The function of the physician in a shop in a dangerous trade is not only medical but also educational. He should not only examine and treat the worker, not only inspect and supervise the plant, but he should above all endeavor to instruct the worker in the risks and dangers of his calling, to teach him the proper methods of prophylaxis and to educate him in the proper methods of health preservation and of prophylaxis of occupational diseases. Such educational activity would be the climax of the benevolent activities of the medical supervisor in the factory and would be the most useful contribution of the medical men towards industrial efficiency and industrial justice.



# Mutter Lecture

---

## THE GALL-BLADDER: ITS PAST, PRESENT AND FUTURE

THE MÜTTER LECTURE OF THE COLLEGE OF PHYSICIANS,  
PHILADELPHIA, DECEMBER 7, 1923

By J. E. SWEET, A.M., M.D., Sc.D.

Professor of Surgical Research, University of Pennsylvania, Philadelphia

---

THE method of study of a problem in medicine is like the method employed in the construction of a modern mechanical appliance. Different materials enter into the mechanical structure, coming from widely separated areas of the earth, passing through the most diverse processes, to be finally assembled into a form familiar to us in everyday life. Such is the ordinary telephone receiver, into which has been wrought rubber from the Tropics, platinum from the Urals, cotton of the Southland, Colorado copper, mica from India. These raw materials, skilfully smelted, spun, baked, are finally assembled into a functioning entity—none may be left out.

And so in the working out of the problems of medicine; many are engaged in the collection of the raw materials—zoologists, embryologists, comparative anatomists, physiologists, pathologists, practitioners of medicine and surgery. Many are skilfully smelting, spinning, baking; had I any serious criticism it would be that too few are engaged in assembling, in putting together what we have, to see not only if the pieces fit, but to learn what sort of things are still lacking, and possibly, what their nature and where they must be sought.

It was with this thought in mind that I chose the problem of the gall-bladder; for it seems that there is a great deal of raw material in the way of knowledge concerning the gall-bladder, but nowhere have I found it assembled. Let us then collect this knowledge and see what sort of an apparatus we are able to construct of the materials at hand; even if we cannot decide just what sort of work it

will do, perhaps we can gather an idea of what sort of work it will not do.

A further thought determining my choice of a subject which might hope to take its place in the notable list of the Mütter lectures, was that a subject concerning which all is not yet known may prove of greater interest to the audience, by its offering of food for thought, than might a finished subject.

I have endeavored to assemble the knowledge which we possess in pictorial form. I am indebted to the artistry of Mr. E. F. Faber for these illustrations, most of which, as you shall see, are taken from work, old and new.

The Gall-bladder: Its Past, Its Present, Its Future! The past of any human organ is written in the history of its development; we may study the lower forms and expect to find the details of their anatomy represented in the stages of the development of the highest form; we may expect to encounter in the human, in the form of anomalies, persisting stages, or atavistic reminders, of lower orders. Or we may study the human embryology and read out of it the details of the anatomy of the lower forms.

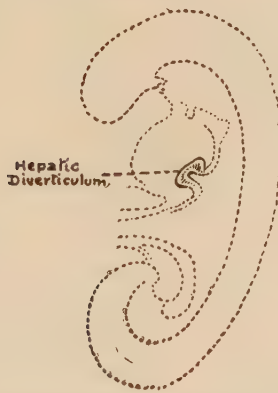
The present of the gall-bladder is the actual structure as we see it in gross and under the microscope.

The future of the gall-bladder—who shall prophesy the future? Yet we are taught that the future of the individual is determined by the kind of life which that individual leads. So if we can obtain an inkling of the sort of a life the gall-bladder leads, of what it does in this world, whether its work be good or evil, perhaps, then, we may venture a prophecy as to whether the gall-bladder is destined to share the heavenly pedestal upon which the pancreas now rests supreme, a pedestal with “*Noli me tangere*” written large upon it, rests safe from the surgeon’s knife if not from his prying fingers; or whether the gall-bladder is doomed to fall into the Hades of Pathology, there, pickled in alcohol, to form a scorned triumvirate with the tonsils and the appendix!

At a very early stage of the embryo, as seen in Fig. 1, which represents a longitudinal section of an embryo of 2 mm., or between three and four weeks, when the gastro-intestinal tract is composed of the fore-gut, the mid-gut connecting with the yolk-sac, and the

hind-gut, a fold of the wall of the fore-gut appears, just above the junction between the fore-gut and mid-gut. This fold, formed just as one might pinch up a fold of one's sleeve between the thumb and finger, represents the beginning of the liver and the gall-bladder. It is spoken of in the literature as a diverticulum, or as a groove, or a furrow. The discussion which has appeared in the literature as to whether the liver develops from one or from two anlagen (a German term still in common use by embryologists, in spite of the

FIG. 1.

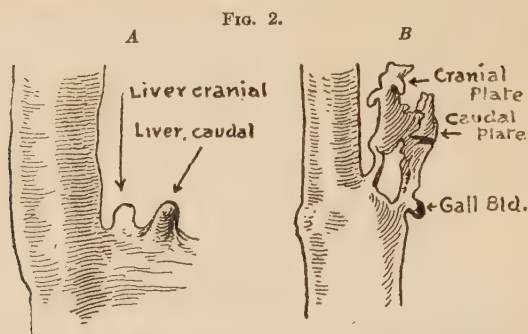


The human embryo, in longitudinal section. (After His.)

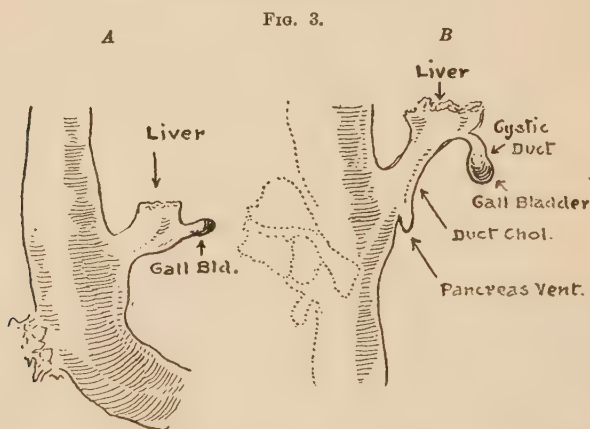
late unpleasantness, to designate the first aggregation of cells which will form any distinct part or organ of the embryo) seems to have been settled in this sense; that one primary groove appears out of which two structures develop. From the upper, the cranial, end, the liver arises, soon growing out as numerous buds, which grow around the dorsal vein, thus embedding the future hepatic vein within the liver substance; from the lower, the caudal, end develops the gall-bladder.

In Fig. 2, we have a picture of a model of the development of the liver and the gall-bladder of the chick. It is to be noted that in the chick both buds retain their continuity with the intestine, thus forming separate channels of entry into the intestine for the bile from the two lobes of the liver, a condition which persists and characterizes the avian type of biliary apparatus.

In Fig. 3, which is a model of the developing liver of the rabbit, the liver anlage seems to have pushed away from the bowel, so that it remains attached to the bowel only by a common duct which has developed from the caudal bud, or gall-bladder anlage.



Reconstruction model of a chick embryo. A, third day. B, fourth day. (After Hammar, *Anal. Anz.*, xiii, 1897, 233. x 50.)



Reconstruction model of a rabbit embryo. B is a more advanced stage of development than A (Same source as Fig. 2.)

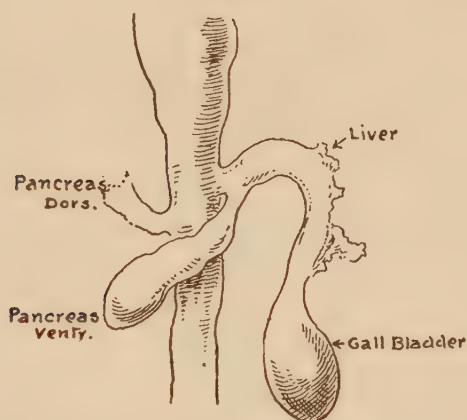
Fig. 4 shows the process of development in the rabbit embryo at a later stage when the differentiation of structure has become more complete.

Such seems to be the consensus of opinion of those who have worked with the subject—that the liver and the gall-bladder arise as separate structures, closely related, coming from the same fold of the fore-gut, but distinct entities nevertheless (Hammar,<sup>1</sup> Brachet,<sup>2</sup> Brouha,<sup>3</sup> Broman,<sup>4</sup> Rietz<sup>5</sup>).



While this point of the embryologic independence of the gall-bladder is emphasized by those who have worked on the subject, there are several facts which will later be demonstrated—the similarity of structure between certain appendages of the bile-duct and the gall-bladder, and the possible enlargement of these structures after removal of the gall-bladder—which incline me to look upon the gall-bladder and the duct system of the liver as a unit, which may in the main arise as an independent embryologic unit. From this point of view, the gall-bladder would be an appendage of the duct system, but not differing, except in form and location, from

FIG. 4.



Further stage of development of rabbit. (Same source as Figs. 2 and 3.)

the ducts themselves. Whichever way we may care to consider it, this remains true: That the gall-bladder develops from that group of ancestral cells at the lower end of the fore-gut which gives birth to such important structures from the standpoint of absorption and of secretory function as are the stomach and the duodenum, the liver, and the pancreas.

This, of course, does not mean that an organ of simple function could not be built out of such raw material. Yet it does not seem likely to me that Nature would take from such potential material for the construction of a simple sac or reservoir. Nature, the great conservationist, would not take from a gold mine to make a tin can. That she can on the contrary transmute an old tin can into purest gold is seen in what she made from Adam's rib!

From this early start, the gall-bladder and its duct develop in much the same way in all species. There is, indeed, some evidence that those species which have no gall-bladder do show these early stages of its development (Rietz<sup>5</sup>). At first the bud growing out from the intestinal wall is hollow; then, the cells lining this little cavity seem to develop so rapidly that the structure becomes solid, to hollow out again later. It is at this stage that certain of the recorded anomalies of the gall-bladder arise; the cystic duct becomes hollow, but the gall-bladder fails in its duty, so that a cystic duct appears, but no gall-bladder. The walls of the gall-bladder stick together through the middle so that a gall-bladder with a septum results, or even a double gall-bladder. The gall-bladder hollows out, but the duct remains a solid strand. It is a noteworthy fact, however, that very few such anomalies have been recorded. Congenital absence of the gall-bladder in those species in which a gall-bladder normally occurs, is very rare.

Such is the general manner of development of the gall-bladder throughout the kingdom of the vertebrates. Differences in detail appear which relate to the final location of the gall-bladder, and more particularly to the manner in which the gall-bladder connects with the duct system of the liver.

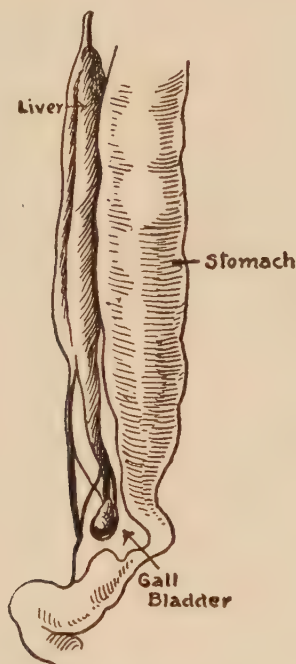
An interesting location of the gall-bladder is found in the true serpents as shown in Fig. 5, which shows the stomach, liver, and gall-bladder of the boa constrictor. Owen<sup>6</sup> explains this by the fact that in the true serpents the prey is usually of large bulk; this enormous distention of the stomach would exert pressure upon the gall-bladder were it in the usual location, and so Nature has removed the gall-bladder to a site beyond the stomach. Another curious condition is found in some reptiles as in Python, where the cystic duct, single at its commencement, divides into numerous branches which penetrate the pancreas and reunite with each other and the hepatic before terminating in the duodenum.

Such differences as this most pronounced one between the location of the gall-bladder in serpents and the location of the human gall-bladder are not basic differences; they are determined by the differences in adult form and anatomic arrangement, rather than by

differences in the embryology. Therefore, we do not find such anatomic peculiarities appearing as anomalies in the human being.

The manner in which the duct systems of the liver and the gall-bladder connect is a matter, however, of embryology. We have seen, in Fig. 2, how the liver anlage of birds remains attached to the intestines by its own duct while in the rabbit (Figs. 3 and 4) the

FIG. 5.



The location of the gall-bladder of the boa constrictor. (After Huntington, "Anatomy of the Human Peritoneum and Abdominal Cavity," Lea Bros. and Co., 1903.)

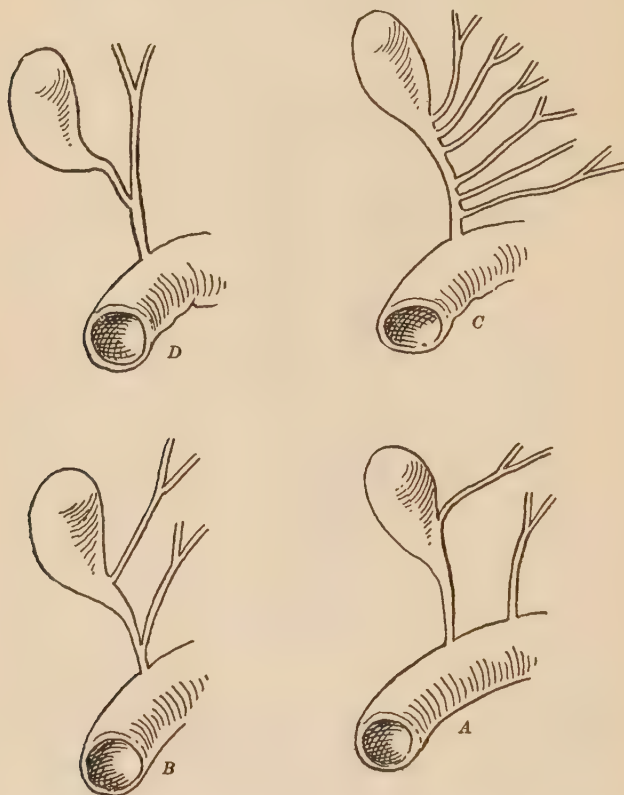
duct system of the liver and the gall-bladder unite to form a common channel into the intestine.

Slight variations in these arrangements occur in various species, so that four types of duct systems have been described. In nearly all birds the arrangement is that seen in Fig. 6 (A), the cystic duct coming exclusively from the right lobe, the left liver lobe draining by an entirely separate duct directly into the intestine. The two systems are, however, connected by radicles within the liver. A slight modification of this arrangement is seen in Fig. 6 (B). The arrangement common in reptiles is schematized in Fig. 6 (C),

and the arrangement familiar to us in the human being is shown in Fig. 6 (*D*).

That atavistic reminders of earlier types are not at all uncommon in the human being is shown in Flint's study<sup>7</sup> of the cystic artery and the duct arrangement in two hundred consecutive autopsies

FIG. 6.



Schemata of the hepatic and cystic ducts and gall-bladder in birds. (Same source as Fig. 5.)

(Figs. 7 and 8). In Fig. 7 are seen variations in the length of the cystic duct and in its mode of union with the hepatic duct.

In Fig. 8 is a condition reminding one of the avian type (*A*). Fig. 8 also brings out certain points of great practical importance to the surgeon, the rather common occurrence of accessory ducts from the right lobe either crossing behind the cystic duct to the hepatic duct (*B* and *C*) or to the common duct (*D*) or to the cystic



duct (*E*)—conditions reminding one of the anatomy of the bile-ducts of the dog. It is probable that the cutting of these accessory ducts during the cholecystectomy is responsible for the cases in which

FIG. 7.



Abnormalities of the bile-ducts. (After Flint, *Brit. Jr. Surg.*, x, 1923, 509.)

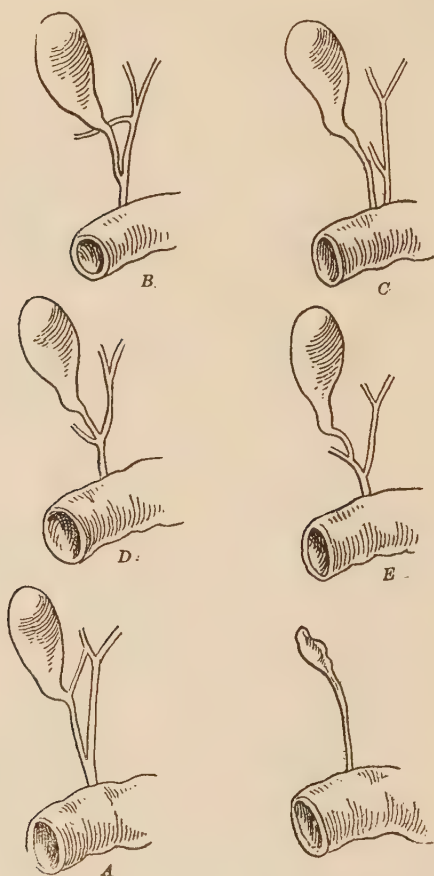
bile leakage occurs, rather than the slipping of the ligature of the cystic duct.

Such is the past of the gall-bladder, and such is the rôle of that past in the explanation of the anomalies encountered. From the source I have pointed out, that segment of the embryonic fore-gut so rich in potentialities, by the complex processes of fetal growth, there has arisen as an independent unit the gall-bladder, or perhaps,

the gall-bladder and the duct system of the liver. What is the structure of the gall-bladder, what is its present?

The human gall-bladder is pear-shaped, about the size of a hen's egg, lying in its groove on the under side of the right lobe of the

FIG. 8.

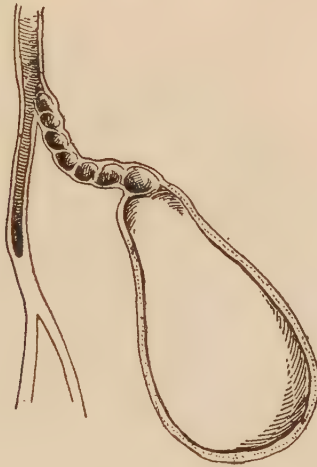


Same as Fig. 7.

liver, near the anterior edge; hanging by its stem, the cystic duct, but also fastened in a varying fashion to the liver surface (Fig. 9). It is usually fastened over nearly one-half of its surface to the liver, and may be entirely surrounded by liver tissue except the tip, in some animals regularly so. It may be entirely free, hanging by a true mesentery.

Two points stand out in this gross arrangement which bear upon the possible function of the gall-bladder. With the exception of those rare cases in which the gall-bladder hangs entirely free in the abdominal cavity, the gall-bladder is so attached by one-third to one-half of its surface to the liver that it could never be entirely emptied by the activity of its muscular wall, assuming, for the moment, that such is the function of the muscular coat of the organ.

FIG. 9.



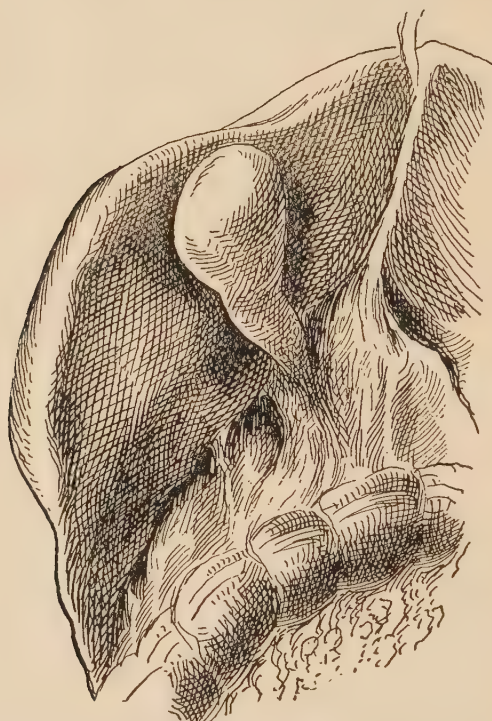
The normal gall-bladder. (After Spalteholz, "Handatlas d. Anat. d. Menschen," Leipzig, 1900, vol. iii, Part I, Fig. 582.)

When the gall-bladder lies entirely buried within the liver tissue, it could hardly be emptied at all by such activity of the muscular coat.

The second point to note is that the relatively fixed part of the gall-bladder is the neck and the cystic duct, which is attached through the fusion of the ligaments supporting the stomach, the duodenum, and the colon to the tendinous portion of the diaphragm. Therefore, any force which tends to displace the anterior edge of the liver downward, such as a tight corset or visceroptosis, will tend to increase the angulation of the gall-bladder on the cystic duct, a factor which has been emphasized in explaining the tendency to gall-stones which seems to be associated with corsets and visceroptosis. It is usually stated in this connection that such displacement prevents the emptying of the gall-bladder, but I would emphasize that such displacement would be equally efficient in preventing the filling of the gall-bladder.

Why is the gall-bladder situated where it is (Fig. 10), beneath the free edge of the liver where it is subjected to pressure with every inspiration? I think not necessarily in order to empty the organ; for, having seen the lymph flow along a canula placed in a lymphatic of the gall-bladder, the column of lymph being pushed onward by every inspiration, I may point out the possibility that the gall-bladder

FIG. 10.



The gall-bladder in its normal position, the liver being turned upward. (Same source as Fig. 9.)

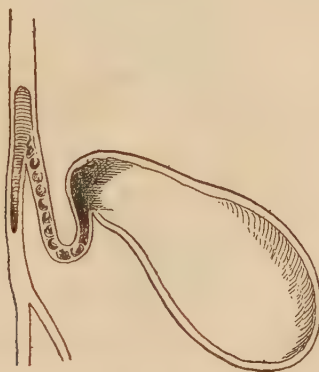
is made subject to the rhythmic pressure of inspiration to aid the flow of lymph and of the venous blood. It is too often forgotten that the main driving force of the lymph from periphery to centre, and an important adjunct to the return of venous blood, is the activity of the skeletal muscles; so in the intra-abdominal organs some force other than *vis-a-tergo* is needed for driving the lymph along, such as the peristalsis of the intestine and the rhythmic pressure exerted on these organs by every inspiration; lymph ceases to flow freely



from the thoracic duct when respiratory movements are stopped; I suggest, therefore, that this influence upon lymph flow is as plausible a reason as any other for placing the gall-bladder where it is placed.

I would also like to call to your attention the fact that, particularly in animals which walk upon all four feet, and even in the few animals which have assumed the erect posture, the gall-bladder is placed at the most dependent portion of the biliary system; a position

FIG. 11.



The cystic kink. (After Poirier and Charpy, "Traité d'anat. hum.," Paris, 1900, Fig. 403.)

which certainly facilitates the filling of the organ, but a position which does not make the emptying any easier.

The angulation of the cystic duct resulting in an S-shaped curve or kink, not always as plainly marked as in Fig. 11, has not been given due consideration in respect to its bearing on the problem of the possible function of the gall-bladder. The manner of origin of this curve or kink has been explained as follows: The cystic artery, growing on to the gall-bladder from the hepatic artery, attaches to the gall-bladder at an early stage, and offers a certain degree of fixation of the gall-bladder; as growth continues and the cystic duct lengthens, it cannot straighten out, because of this fixation of the gall-bladder by the cystic artery, and, therefore, the duct becomes thrown into curves. Whatever may be the explanation of its origin, the mechanical effect of such a kink must be to constitute a sort of valve, pressure on the filled gall-bladder kinking and shutting off the cystic duct, preventing the emptying of the gall-bladder through

the cystic duct, but being equally efficient in preventing the further filling of the gall-bladder.

This gross valve action seems to be increased by the spiral fold of the mucous membrane lining the duct and the neck of the gall-bladder of the human being, a curious structure which has long been known, but to which little attention has been paid in the literature, and no attention at all in the discussions of the possible function of the gall-bladder. This spiral fold was first described and pictured by Lorenz Heister, called the "Father of German Surgery," who lived from 1683 to 1758, and it is still known as "Heister's valve." From Heister's own words, however, it would seem that such a structure in the cystic duct had long been under discussion, for Heister<sup>8</sup> mentions that Glisson, the English anatomist who died

FIG. 12.



The valve of Heister. (After "Compendium Anatomicum," Amstelodami, 1723.)

several years before Heister was born (1597–1677), had never found such a valve.

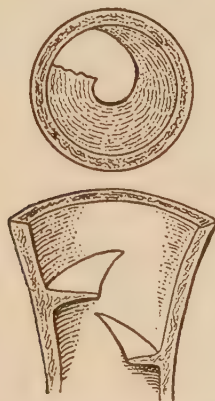
"Glissonius (Tract. de Hepate cap. 14.) quidem ait, Anatomicos quosdam in ductu cystico valvulas effinxisse, se autem credere fibrosum annulum cystidis iis invenisse, se enim nunquam valvulam ibi invenisse. Ita & Bianchus (Hist. hepat. cap. 14. p. 2.) inquit, valvulas cystis felleæ collum & cervicem occupantes, imiginarias esse. Verum an non hæ indicatæ partes, non semel, sed ab aliquo tempore in plerisque cadaveribus repertæ, sint dicendæ valvulæ, aliis dijudicandum relinquo. Ita & Quem usum hic præstare queant, doctoribus indigandum commendo."

The old anatomical method of preserving hollow viscera for permanent specimens—blowing them up with air and drying them as shown in Fig. 12, taken from Heister's own work—is possibly the best method of demonstrating the valve of Heister. The abandonment of this crude method with the advance of medicine may explain why the structure has escaped the prying eye of modern generations.

Hendrickson<sup>9</sup> seems to be the only one of recent years who has studied this valve-like device (Fig. 13).

It is a fold of the mucous membrane arranged in spiral form, with the larger folds in the neck of the gall-bladder, the folds growing less marked down the duct, exactly like the thread of a

FIG. 13.



The valve of Heister. (After Hendrickson, *Johns Hopkins Hosp. Bull.*, ix, 1898, 221.)

wood screw, with the head of the screw in the gall-bladder, the point in the cystic duct.

But this device is more than a fold of a membrane; the folds contain muscle fibres, arranged longitudinally and transversely (Figs. 14 and 15), seemingly placed to manipulate the valve leaflets.

Heister (*loc. cit.*) decided to leave the discussion of the purpose of this structure to someone else, and apparently each generation since has followed his lead. The only suggestion I have encountered is the one offered by Keith,<sup>10</sup> who, in discussing the relation between enteroptosis and gall-stones, says that in enteroptosis the gall-bladder is so displaced that the fundus and the common duct tend to lie parallel instead of at an angle of  $35^{\circ}$  to  $45^{\circ}$ ; a strain at the same time is thrown on the cystic duct, "which even in normal conditions requires a spiral valve to keep it open." With this thought I cannot agree—the valve of Heister is too delicate for such purpose. The only explanation of these two devices—the cystic kink and the valve of Heister—which appeals to my mechanical sense, is that they are

designed, and efficiently designed, to hinder the emptying of the gall-bladder by external pressure.

I presume the time will yet come in these days of such rapid surgical advance when some youthful enthusiast will put on the market an operation for the relief of heisterian spasm!

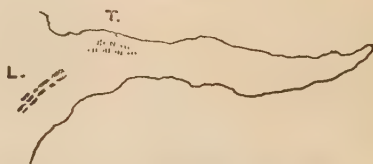
The gall-bladder is ordinarily described as being made up of four layers: First, an external covering of peritoneum over that portion of the organ which is not attached to the liver; second, a layer of connective tissue in which, but near the mucus lining, is, third, a

FIG. 14.



Longitudinal section of the cystic duct of dog, showing the musculature of a heisterian valve.  $\times 30$ . (Same source as Fig. 13.)

FIG. 15.



One of the longitudinal serial sections of the cystic duct of man, showing the musculature of a valve of Heister.  $\times 30$ . (Same source as Fig. 13.)

layer of delicate muscle fibres, running in an interwoven layer of circular, longitudinal, and diagonal strands. The lining, fourth, is a single layer of tall columnar epithelium. Throughout the connective tissue, which holds the layers together, run blood-vessels, lymphatics, and nerves.

The peritoneal covering and the connective tissue of the gall-bladder merit no special attention. The muscle coat, however, deserves closer study because of its relation to the possible function of the organ, and because so much has been said of it in recent years. It is not a powerful affair, but a delicate mechanism.

All those who have especially studied it seem united in the opinion that it is a *muscularis mucosæ*, that is, a layer of muscle fibres more intimately related to the mucous membrane than to deeper lying structures, the function of which is to throw the mucous membrane into folds, and to vary the size and shape of these folds,



to move the lining membrane around over the content of the viscus (Hendrickson,<sup>9</sup> Sudler,<sup>11</sup> Shikinami,<sup>12</sup> Berg<sup>13</sup>). Hendrickson (Fig.

FIG. 16.



Longitudinal section of the gall-bladder of man.  $\times 30$ . (Same source as Fig. 13.)

16) shows cross-sections of the wall of the gall-bladder, showing the interweaving course of the muscle fibres.

Berg shows pictures of gall-bladders prepared by maceration

FIG. 18.

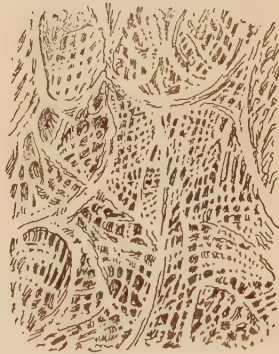


FIG. 17.



The musculature of the gall-bladder.  $\times 4$ . (After Berg, *Nord. Med. Arkiv.*, Afd. I (Kirurgi), 1, 1917-18, Häft 3, No. 9.)

The musculature of the distended gall-bladder. (Same source as Fig. 17.)

(Figs. 17 and 18), which show very clearly how the characteristic reticulated appearance of the interior of the normal gall-bladder is determined by the course of the muscle bundles lying close beneath the single layer of columnar lining cells.

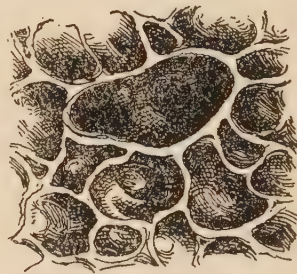
These folds of the gall-bladder lining are pictured by Boyd,<sup>14</sup> who rises to poetic heights in his description of them (Fig. 19). "In text-books of anatomy one reads the statement that the mucous membrane of the normal gall-bladder is thrown into folds. But this conveys little to the mind until the gall-bladder is viewed direct under the dissecting binocular microscope. When the fresh gall-bladder, immersed in water, is observed by reflected daylight, or, still better, by the brilliant light of an electric arc, the picture is a remarkable and beautiful one. As if one were gazing into the depths

FIG. 19.



Cross-section of a fold of the gall-bladder. (After Boyd, *Brit. Jr. Surg.*, x, 1923, 333, Fig. 280.)

FIG. 20.



The folds of the gall-bladder mucosa. (Same source as Fig. 9, Fig. 583.)

of a marine pool at seaweeds and sea anemones, tall, graceful folds and membranes, gossamer-like in their delicacy, can be seen floating in the ambient fluid. The entire inner surface is divided by these membranes into a series of polygonal spaces, and each of these spaces resembles a little courtyard surrounded by high, though delicate, walls." And I would add thereto, and emphasize, that the walls of each little courtyard (Fig. 20) can be moved about by the muscle bundles which determine them.

What of the rhythmic contractions of the musculature of which much has been heard in recent years? (Bainbridge and Dale<sup>15</sup>.) So far as I am able to determine, they are only the rhythmical movements which are common to smooth muscle and are of no importance as an agent in emptying the organ. This type of movement,

particularly of a *muscularis mucosæ*, might well bring fresh surfaces of mucosa in contact with the content and move the content about so that the fluid in the centre would be brought into contact with the mucosa; such movement would also help in the driving onward of the lymph in the walls of the organ.

Within the tissues of the gall-bladder wall course blood-vessels, nerves, and lymphatics. The arterial supply is from the hepatic artery, through the cystic artery; the veins empty into the portal vein. According to Beale<sup>16</sup> (Fig. 21), the arrangement of the vessels of the gall-bladder is very peculiar; "each branch of artery is accompanied by two branches of the vein and this arrangement

FIG. 21.



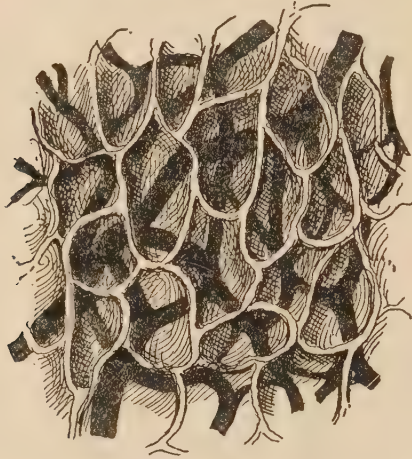
The blood-vessels of the gall-bladder. (After Beale, "The Liver," London, 1889, Fig. 9.)

exists even in the case of very small divisions; the small branches of the arteries anastomose very freely, in some cases forming five- or six-sided spaces, so that an arterial net-work is formed. This is wonderfully developed on the external surface of the gall-bladder. Each artery composing this net-work is accompanied on either side by a branch of vein. \* \* \* The wonderful arrangement of the *venæ comites* is not easy to account for, but it is very remarkable, and it is found to the extent here demonstrated as far as I am aware in this organ only." A very rich blood-supply also passes to the bile-ducts throughout the liver. Sudler<sup>11</sup> emphasizes the "exceptionally rich capillary net-work" beneath the folds of the mucous membrane of the gall-bladder. Luschka<sup>17</sup> mentions the rich blood-supply of the edges of the folds.

In the crypts formed by the folds, just under the mucous membrane, solitary lymph follicles are found, with an elaborate plexus

of intrinsic lymph channels in the submucous tissue (Figs. 22 and 23). These figures from Sudler's work (*loc. cit.*), particularly this reconstruction model, emphasize very strongly the extent of the

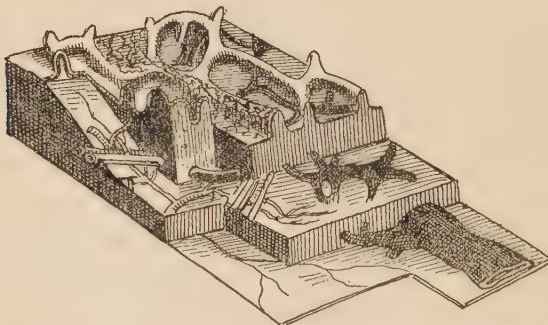
FIG. 22.



The lymphatics of the gall-bladder. (After Sudler, *Johns Hopkins Hosp. Bull.*, xii, 1901, 126.)

development of the lymphatic apparatus of the gall-bladder; a similar close relation exists between the mucosa of the bile-ducts and the blood and lymph supplies. This intimate relation between biliary

FIG. 23.



Reconstruction of the wall of the gall-bladder. (Same source as Fig. 22.)

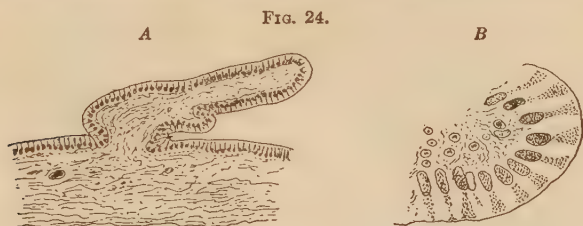
system and lymphatic system assumes a real importance to surgery and surgical pathology when we stop to think that every localized infectious process is a lymphangitis.



The activity of the lymphatics has been demonstrated in our laboratory by introducing into the gall-bladder a hypertonic solution of potassium sulphocyanide, then collecting lymph from fine tubes inserted into the lymph vessels of the gall-bladder, and testing the lymph obtained with ferric chloride. In fact, working as rapidly as possible, the first specimen procured gives a positive Prussian-blue reaction (Harer, Hargis and Van Meter<sup>18</sup>). This lymph from the wall of the gall-bladder also gives positive chemical reactions for bile-pigments and bile salts.

The gall-bladder, according to Freese,<sup>19</sup> receives both motor (constrictor) and inhibitory (dilator) nerve fibres from the splanchnic nerve. Sympathetic fibres doubtless follow the artery.

There still remains the fourth component layer of the gall-bladder



Section of the human adult gall-bladder. A, x 100; B, x 560. (After Stöhr, "Lehrbuch d. Histologie," Jena, 1910, Fig. 224.)

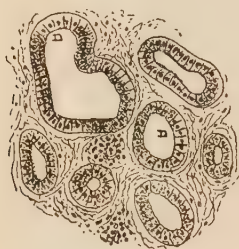
to be considered; and if we have any reason to suspect from what we have seen thus far that the gall-bladder is something more than a mere reservoir, or a pressure-regulating safety device, then this layer deserves especial notice, for it would be by the activity of the lining cells that any function other than a mechanical one would be carried out.

The mucosa of the gall-bladder is composed of a single layer of rather high columnar cells, by some described as containing granules in their protoplasm toward the free edge of the cell (Fig. 24). These cells are comparable with the cells lining the intestinal tract, and just as in the intestine, the total surface area is enormously increased by the folding of the membrane. In the intestine this folding is regular, and the folds are known as villi; in the gall-bladder the folds are less regular, but more delicate. A few glands, it is said, are found in the gall-bladder and these mostly near the neck.<sup>17</sup> The glands described as Luschka's glands are simply out-pouchings of the mucosa

through defects in the muscular coat. In fact, in view of certain structures presently to be described, it is doubtful whether any true glands are to be found in the gall-bladder wall.

This same type of high columnar epithelium, marked by stippling, or striæ, of the free edges, is found in another place in the body. May I ask your indulgence to leave the gall-bladder for a moment and wander up the bile-ducts, for the bile-ducts are lined with this same type of cell. Another cell is pictured as occurring with them in the bile-ducts, a larger cell without the striation (Fig.

FIG. 25.



Cross-section of the bile-ducts. (After Kölliker, "Handbuch d. Gewebelehre d. Menschen," Sixth Edition, Leipzig, 1902, Fig. 1020.)

FIG. 26.



The "scrobes depressæ" of Haller. (After Henle, "Handbuch d. Eingeweidelehre d. Menschen," Braunschweig, 1862, Vol. II, Fig. 148.)

25 D). Whether this cell really represents a different cell or only a different stage of activity of the same cell is not clear.

If we go back to the literature of a hundred years ago, before the day of the microtome and the aniline dye, to those days when men were trained in the use of the most perfect optical instrument yet devised, the human eye, an instrument which possesses another striking peculiarity beyond its perfection, that it is, sometimes, closely associated with a brain, we will find two structures described which later anatomists have either never seen, or seeing, have lightly passed over. The days I speak of were the days of anatomy when injection and corrosion preparations were in style, a technic little used to-day, but possessing certain advantages.

The inside of the larger bile-ducts is found to be provided with minute depressions, in the human arranged in parallel rows (Fig. 26). These depressions, known to Haller and called "scrobes depressæ" by him, open into two structures; the one is the blind

ending ducts discovered by Ferrein<sup>20</sup> and called "vasa aberrantia" (Fig. 27). These seem to be the remains of previously functioning ducts, the liver tissue which they drain having been lost through pressure atrophy; they are most numerous along the portal fissure, and are found where pressure atrophy has apparently occurred. They also seem to occur lying free in the connective tissue between the larger extrahepatic ducts, as is seen in Fig. 28, a preparation from one of our own specimens. The vasa aberrantia have not been entirely lost to sight, but the other structures into which the scrobæ depressæ open have disappeared from modern textbooks, or perhaps are lightly passed over as mucous glands. I refer to the little sac-like

Fig. 27.



The "vasa aberrantia" of the bile-ducts. (Same source as Fig. 21, Fig. 10.)

Fig. 28.



The "vasa aberrantia" of the dog. (Original.)

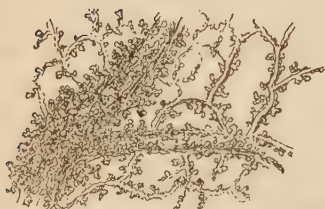
appendages (Fig. 29) discovered by Theile,<sup>21</sup> called by him, without any reason I am able to find in his description, "Schleimdrüsen," perhaps best called "parietal sacculi," which are found all along the bile-ducts within and without the liver, differing somewhat in their form and number according to the individual and to the species, but not found along the common duct below the opening of the duct of Wirsung, a fact of interest in those animals in which the duct of Wirsung opens very high up into the common duct.

A comparison of Fig. 29 with Fig. 30 shows why these structures have been lost sight of in later years. The cross-section of the empty collapsed duct, a thin section, cut with a microtome, stained with aniline dye, shows only a folding of the mucosa, with cross-sections of structures, which might be glands, or which might be but the edges of the neighboring folds of the mucous membrane. The question of whether these structures can be brought out by the influence of chronic irritation is raised by Figs. 31 and 32, from the collection

of Dr. Allen J. Smith, which show structures very suggestive of the possible accentuation of the parietal sacculi by the presence of the parasites.

The most extensive description of these parietal sacculi is found in Beale's work,<sup>16</sup> in which is also found the refutation of the

FIG. 29.



Anastomoses of the bile-ducts as seen by a magnification of 18 diameters. (Sappey, "Anat. descriptive," Paris, 1889, vol. iv, Fig. 825.)

FIG. 30.



Cross-section of bile-duct. (Same source as Fig. 25, Fig. 1019.)

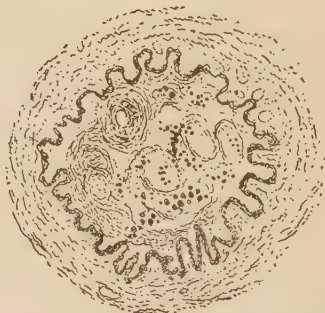
assumption that they are mucous glands. Beale finds that the bile of the rabbit, in which animal the sacculi are almost absent, contains

FIG. 31.



Coccidiosis, rabbit liver. (From the collection of Dr. Allen J. Smith, University of Pennsylvania.)

FIG. 32.



Dicrocoelium dendriticum, sheep liver. (Same source as Fig. 31.)

as much mucus as does the bile of the pig, in which animal they are exceedingly numerous and are arranged entirely around the ducts (Figs. 33 and 34). These little pouches lie within the fibro-muscular wall of the duct. They have an abundant blood-supply and are in such close relationship with the lymphatics that the lymph



vessels are commonly injected in the course of demonstrating the sacculles.

As to the function of these structures, Beale remarks (*loc. cit.*, p. 51) "in fact, I think that we may almost regard them as supplementary little gall-bladders appended to the ducts." With this

FIG. 33.



The parietal sacculi of the pig. (Same source as Fig. 21, Fig. 16.)

FIG. 34.



One of the sacculi of the pig. (Same source as Fig. 21, Fig. 17 of the original.)

thought in mind it is interesting to compare *A* (Fig. 35), the bile-ducts of the horse with the parietal sacculi, an animal which has no gall-bladder, with *B* and *C* (Fig. 35), the same structures from the pig and cat, which animals have gall-bladders.

And now, if the future of an organ of the body is to be determined on the same principle as determines the future of the collection of all

FIG. 35.



The parietal sacculi of the horse (*A*); pig (*B*); cat (*C*). (Same source as Fig. 29, Fig. 826.)

the organs of the body, the individual, that is, by the kind of a life the individual leads, what does this organ, the gall-bladder, do? This little sac growing from an ancestral cell group filled with potential possibilities, growing independently of the liver in an embryologic sense, developing a blood-supply characterized by its richness and

by a peculiar arrangement of the veins, possessing an unusual lymphatic drainage, provided with a double valve device at its outlet, manifestly designed to prevent out-flow, possessing a lining membrane composed of cells comparable only with the cells of the intestine, whose powers of secretion and absorption have never come into question—assuredly we must begin to suspect that a structure so complex is made for something other than storage, or than a pressure-regulating device!

The common concept of gall-bladder function is not new; it is the same as was expressed by Heister just two hundred years ago

FIG. 36.

*Ufus & Vespula felleæ: colligere bilem, ulterius  
eam perficere, ad certum tempus confer-  
vare, & tandem expellere.*

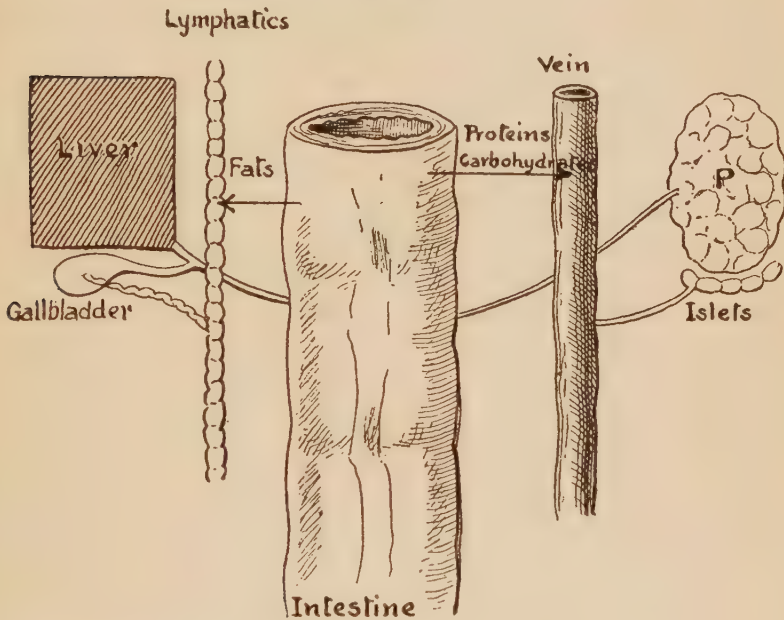
(Fig. 36), and there is no evidence in his writings that he considered his explanation anything new. Yet in Heister's definition, as in many which appear throughout literature since his time, there is a suggestion of something deeper, something beyond mere mechanics, "ulterius eam perficere." Thus Owen (*loc. cit.*) adds to his mechanical explanation of the curious location of the gall-bladder in serpents, "the gall-bladder is not, however, a simple reservoir; its vascular and secreting inner surface can operate upon the bile by both subtraction and addition."

So much has been written, so many suggestions discussed—and cussed—that perhaps the best method would be to wipe the slate clean and start anew. Even though the process involves something which seems to cause acute spinal shudders to so many, the introduction of a new theory! These I will comfort ere I start by saying that we may not find the theory so entirely new after all.

We have, alongside the upper intestine, the pancreas, which elaborates and pours into the intestine an excretion which has to do with the breaking up and the absorption of the proteins and the carbohydrates. The products of this digestion are taken up through the intestinal wall into the blood-stream. Closely associated with the pancreas is another organ, the islands of Langerhans, the secretion of which is added to these products of digestion within the blood-

stream and before this blood in the portal vein has reached the liver (Fig. 37). In a similar relation to the intestine stands the liver, pouring into the lumen of the intestine an excretion which has to do with the absorption of fats. These products of fat digestion pass through the intestinal wall into the lymphatics. Closely associated with the liver is found another organ, the gall-bladder, which may, in analogy with the activity of the islands of Langerhans, add

FIG. 37.



Schematic outline of the function of the pancreas and liver. (Original.)

something to the lymph which is carrying the products of fat digestion, before the lymph passes into the general circulation. The geographic analogy is complete; we have seen that the gall-bladder possesses an abundant lymph supply, and that the absorption through these lymphatics is very rapid. Is there any evidence that our analogy holds good, that the gall-bladder has anything to do with the metabolism of the fats? In speaking of the metabolism of the fats, I would like it to be kept in mind that I mean the fat metabolism in general, including fats, fatty acids and lipoids.

Many writers have sought some suggestion of the function of the gall-bladder in a comparison of those species which possess gall-bladders with the species which have none; but they have abandoned the attempt on finding closely related individuals in both groups; for instance, the two-toed sloth has a gall-bladder, the three-toed sloth has none. But in a broader way there is a difference. The true meat eaters possess gall-bladders, while the varieties lacking this organ are, in the main, herbivorous. The main element present in a meat-diet and not found in a vegetable diet is animal fat; and certainly the fat element of the diet is almost entirely lacking in the grass eaters.

There is further, I believe, good clinical reason for assuming a relationship between the gall-bladder and fat metabolism. That famous slogan of Philadelphia's Master of the Gall-bladder and of epigram, "Fair, fat and forty—gall-stones," is a fact universally admitted. That, in general, gall-stones occur in people who are overweight, that is, who are possessed of some manifest abnormality of fat metabolism. Further, many patients put on weight after cholecystectomy; and patients without a gall-bladder are often unable to handle a fat-diet, and are commonly cautioned against eating fat. According to Mikaye, as quoted by Berg,<sup>13</sup> gall-stones occur in a much lower proportion of Japanese women than in the women of the Occident. We are accustomed to about five women to one man. In Japan, the ratio is three to two. This may, or may not, be due to the fact that Japanese women do not wear corsets; of more immediate importance is the fact that the gall-stones encountered in the Japanese, who are vegetarians, are pigment stones, not cholesterol stones.

And now for the comfort of those who dread a new theory. In 1846, Rudolph Virchow <sup>22a</sup> described the gradual filling of the cylinder cells of the gall-bladder mucosa with fine fat granules. In a later article,<sup>22b</sup> he speaks of an intermediate metabolism of fats in the wall of the gall-bladder; he compares the process with the absorption of fats by the cells of the intestine, a comparison supported by the striking similarity between the mucosa of the intestine and the mucosa of the gall-bladder.

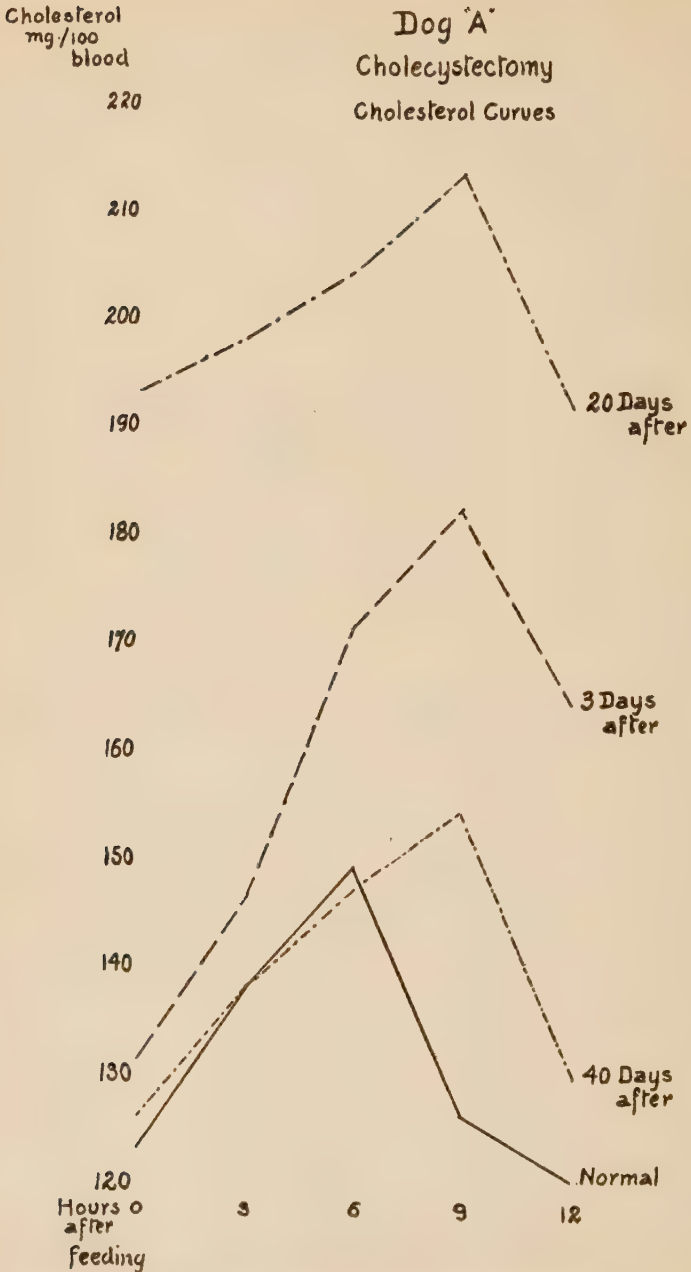


“As regards the filling” (of the cells of the mucosa of the gall-bladder) “with fat, it is comparable to a hair with the resorption of chyle by the intestine. At first very finely granulated fat appears, later large glistening drops. At first the fat appears in the upper layer of the cell, close beneath the homogeneous edge, while the deeper portions are still free. Then it gradually advances deeper, until the entire cell, with the exception of the nucleus, is filled and stretched. It is at this time, when the fat droplets lie in rows, so that they form parallel strings of pearls from cell cover to cell peak, that an appearance is imparted to the cell like that of the fatty degeneration of a muscle bundle. The fat then disappears from the outer portions of the cell, and one finally sees only the base, still saturated with fat droplets while the surface and the centre are entirely free.” (Virchow,<sup>22b</sup> p. 576.) Virchow believes that one must conclude from this observation that the gall-bladder possesses a further function than that of a mere reservoir, and that this function is that of taking fat from the bile and restoring it to the circulation, together with other things.

In 1906, Aschoff,<sup>23</sup> in a paper “in regard to the formation of cholesterol by the gall-bladder,” was unable to confirm Naunyn’s belief (no reference given by Aschoff) that the epithelium of the gall-bladder produces cholesterol. He did show by experiment that the epithelial cells of the gall-bladder can take up neutral fat from the content of the gall-bladder, and that this fat is found in the lymphatics; he states that cholesterol esters can be taken up in the same way. He thinks that this phenomenon is of importance because the fats are solvents of the cholesterol, and the removal of the fat from the gall-bladder content would favor a precipitation of the cholesterol.

In 1914, Policard<sup>24</sup> concluded that a fat absorption takes place in the gall-bladder in a manner entirely comparable with the process in the intestinal epithelium. Successive stages can be followed, and there is an alternation of function, not between individual cells, but between different areas of the epithelium; this alternation of function is dependent on changes in the circulatory apparatus.

FIG. 38.



The cholesterol of the blood of the normal and the cholecystectomized dog. (Original.)

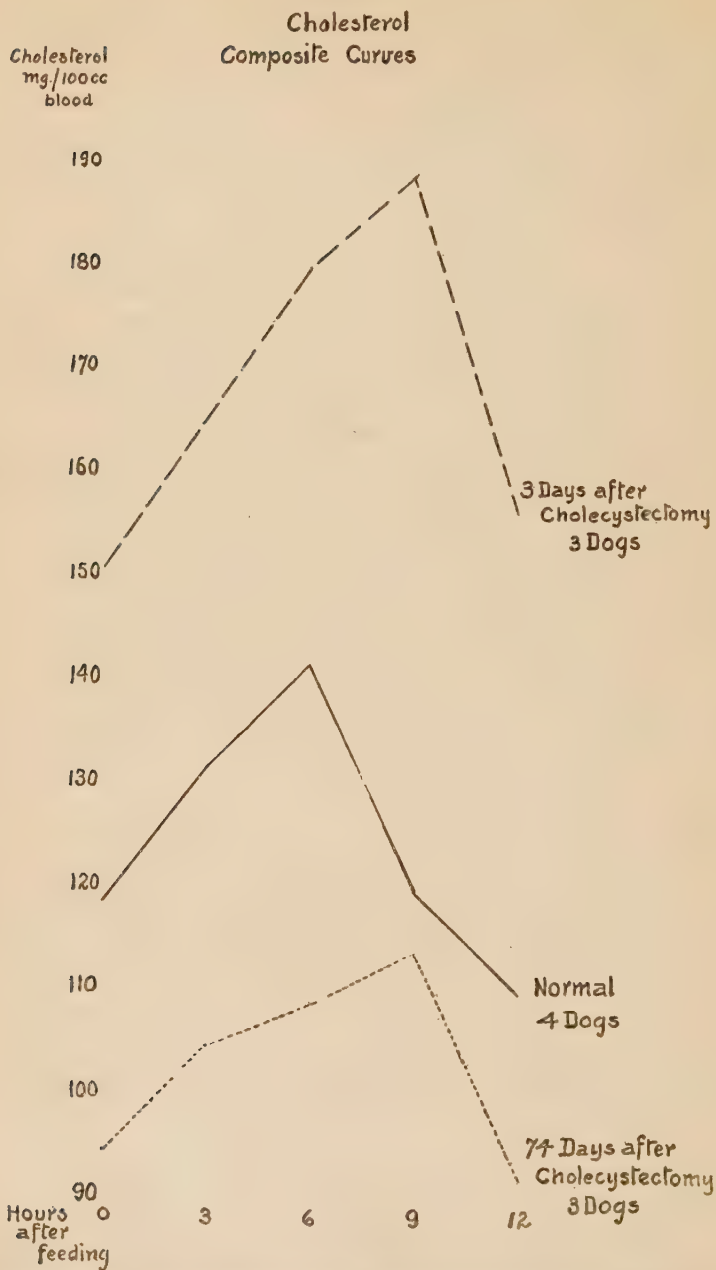
In 1923, Boyd,<sup>14</sup> using all the resources of modern science, concludes that the fat-like substance found on the surface, and in the cells, of the gall-bladder mucosa, particularly in the condition known as "strawberry gall-bladder," is an ester of cholesterol, and he advances the suggestion that the function of the gall-bladder is one of absorption, and that possibly one of the chief substances absorbed is the cholesterol of the bile.

There are, in the literature, many other references to the relation of the gall-bladder to cholesterol metabolism; it would lie beyond the scope of this paper to attempt a complete analysis of this literature, nor would the gain be great. We were, however, prompted to try the following experiment: To feed a normal dog a known fat meal and to determine the cholesterol content of the blood at definite intervals thereafter. This work was made possible by the collaboration of Dr. George W. Wagoner, and we are greatly indebted to Dr. W. G. Karr, of the Department of Chemistry of the Laboratory of the Philadelphia General Hospital, for his constant help in the involved chemistry. After an interval, the gall-bladder was removed, and then at certain times the procedure was repeated, giving the same known fat meal at the same hour before each experiment. The results appear in Fig. 38, showing the results obtained in one animal, and in Fig. 39, a composite curve of four normals and three cholecystectomies.

Two things are apparent from these curves; the total blood cholesterol rises very noticeably immediately after the removal of the gall-bladder; it rises to almost double the normal, and then falls to the normal level forty days after operation, and is considerably below normal at seventy-four days. We have one observation at three hundred days after operation when the curve approaches the normal. The second noticeable fact is that the peak of the rise following fat ingestion occurs normally at the sixth hour; whereas, after the removal of the gall-bladder, the peak is reached at the ninth hour.

There seems to be always a certain balance preserved in the body between the two blood lipids, cholesterol and lecithin; we, therefore, in the beginning of our work included a determination of lecithin.

FIG. 39.



The blood cholesterol: Composite of four normal and three cholecystectomized dogs. (Original.)



The results in one animal appear in Fig. 40. The curves show that the lecithin content of the blood is not much disturbed, the difference which appears in Fig. 44 being more apparent than real. Yet the same three-hour delay in attaining the height of the curve is shown by the lecithin.

An enthusiastic appraisal of these curves might lead to many suggestions; a modest evaluation would be that they show very clearly and conclusively that the removal of the gall-bladder does exert a considerable and definite effect upon the metabolism of cholesterol.

We know that cholesterol occurs in the blood in two forms, as free cholesterol and as an ester, or combination of cholesterol and some fatty acid. We have seen from Boyd's work that the lipid found in the gall-bladder in pathological conditions is a cholesterol ester. How does the removal of the gall-bladder affect the forms in which cholesterol appears—is the increase due to an increase of free cholesterol esters, or of both in normal proportions?

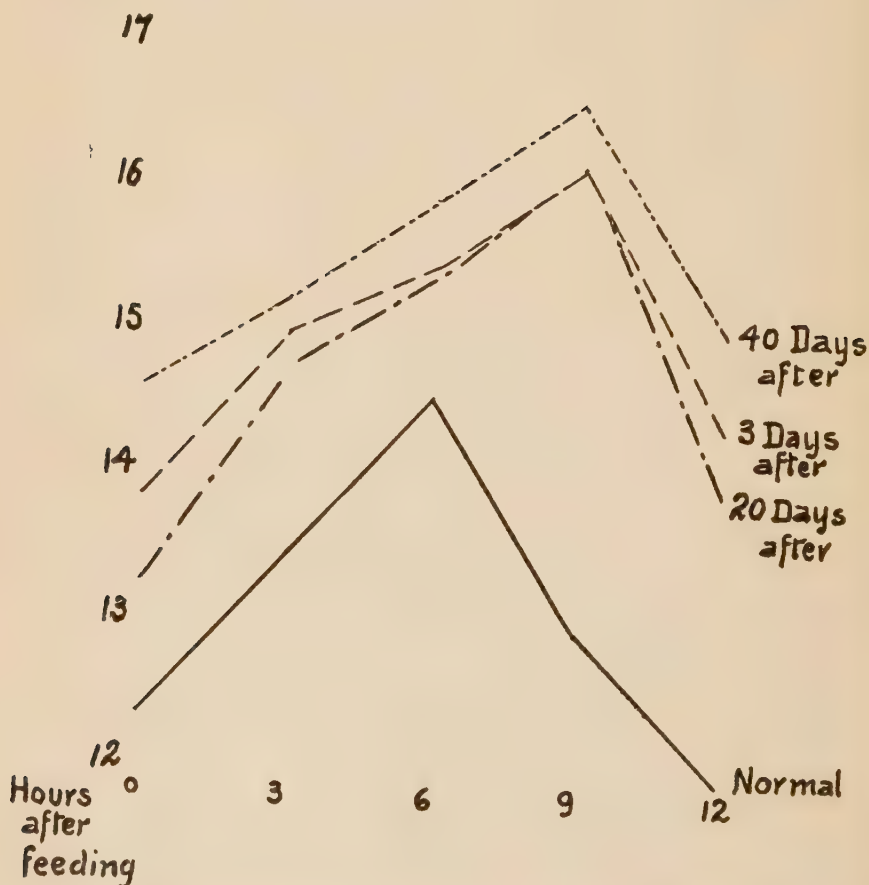
To determine this point the cholesterol of the blood from a normal animal was partitioned by Doctor Karr and Doctor Wagoner, the usual fat meal having been given, and the usual time periods being observed. The blood cholesterol in four cholecystectomized dogs was then partitioned under the same conditions. The composite curves of these results appear in Fig. 41. It is evident, then, that the marked rise in total blood cholesterol is due to an increase in the amount of cholesterol esters; the free cholesterol is not disturbed by cholecystectomy, nor is it much changed by fat ingestion.

What is this substance cholesterol, and what is its importance to the body? The name "cholesterol" is the newer form of the word "cholesterin," the chemists having adopted the uniform ending -ol to designate those bodies which belong to the alcohols. Chemically it is a monatomic alcohol, that is, it contains one alcohol grouping. Physically, it possesses certain of the properties of fat, is soluble, for instance, in fat solvents, hence is classed with the fat-like substances, the lipoids. Because it is an alcohol, it can form combinations with acids called esters. Cholesterol is found in all the tissues of the body, the amounts in nervous tissue being very noteworthy. The brain contains from 1 per cent. to 4 per cent. of this alcohol,

FIG. 40.

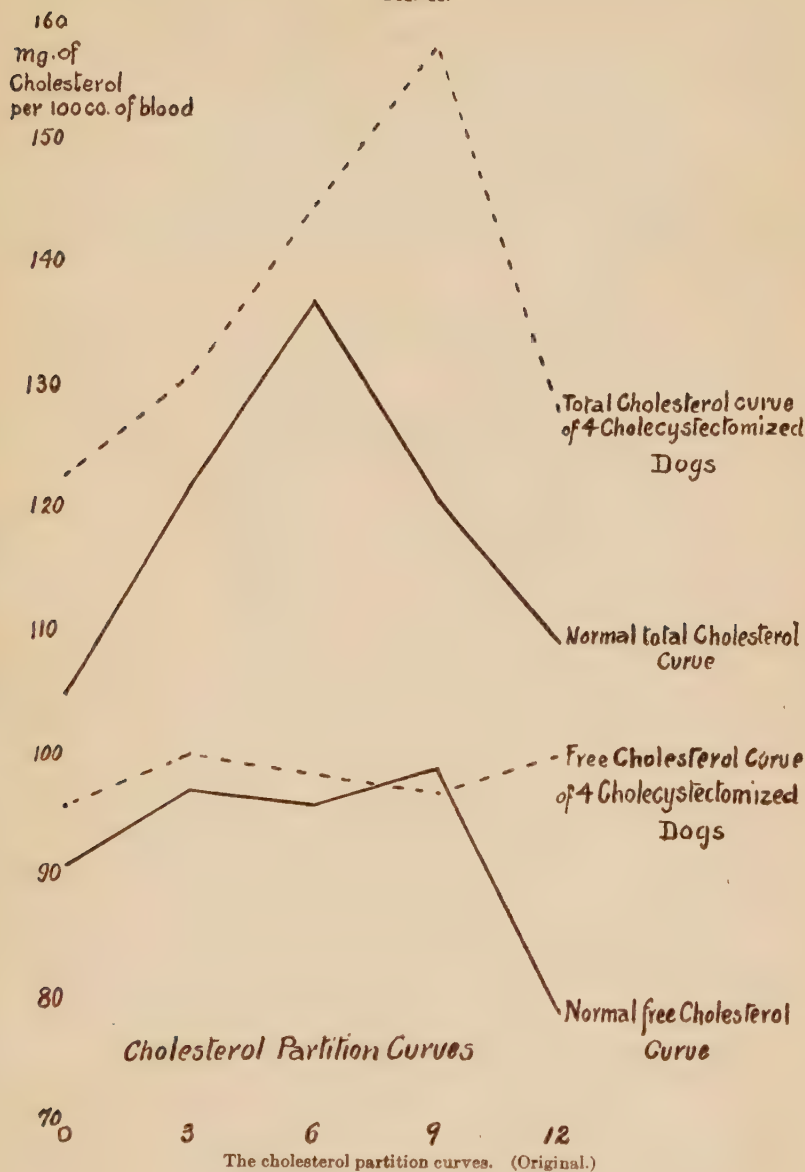
Dog "A"  
(Cholecystectomy)  
Lecithin Curves

Lecithin  
expressed in  
mg. of Phosphorus  
per 100 c.c. of  
blood



The lecithin of the blood of the normal and the cholecystectomized dog. (Original.)

FIG. 41.



the higher amounts being found in the white substance. I hesitate to point out this horrible fact, since an alcohol content of more than 1.5 per cent. is against the Volstead Act of these United States, and I fear lest, the fact being known, a movement shall be immediately started to legislate this illegal percentage out of our systems! As far as we know, cholesterol cannot be built up, synthesized, by the body. An isomer, phytosterol, is widely distributed in the plant world. But very little is known about the physiology of cholesterol; it seems well established that the cholesterol of the bile is carefully conserved and returned to the body.

The tendency of modern physiological chemistry is to feel that these blood lipoids, cholesterol and lecithin, are of importance to the body by entering into the structure of cell-membranes; and if such be the case, it behooves the simple-minded surgeon to leave the chemists there, struggling with the problem on the slippery surface of the cell-membrane, which membrane they would tell us is, after all, nothing, only the meeting-place, the interphase of two liquids!

The greatest stumbling-block to an assumption of an essential function of the gall-bladder has been the fact that no one has ever shown any structure along the biliary system which might take over the supposed function of the gall-bladder when the gall-bladder had been destroyed by disease or removed by surgery. I have dwelt at length on the appendages of the bile-ducts called "parietal sacculi" by Beale<sup>16</sup> because of their similarity to the gall-bladder; they are lined with the same type of epithelium as characterizes the gall-bladder lining, which epithelium bears the same intimate relationship to a rich supply of blood-vessels and lymphatics as we have found exists in the gall-bladder. Analogies so close as to lead Beale to the suggestion that we must look upon them as minute gall-bladders.

If these structures do have the same function as the gall-bladder, they should show differently in animals which have no gall-bladders, and should show hypertrophy after cholecystectomy; Fig. 35 shows the parietal sacculi of the horse, which has no gall-bladder, and the pig and cat, which have gall-bladders, and suggested the experiment, which is not difficult, of comparing the findings in normal animals with those in animals whose gall-bladders have been removed.



This we have done, our work along this line being made possible by the collaboration of Mr. E. M. Landis, of the second-year medical class of the University. The time element in our experiments was based on the curves of cholesterol in the blood after cholecystectomy. In the normal dog (Fig. 42) we find these parietal sacculi existing along the biliary ducts both within and without the liver as single and compounded structures varying in numbers and size in different individuals; but in all the normal specimens that we have examined the common characteristic is that these structures are flattened; after the removal of the gall-bladder (Fig. 43), at the time when we know

FIG. 42.



The parietal sacculi  
of the normal dog.  
(Original.)

FIG. 43.



The parietal sacculi  
of the cholecystecto-  
mized dog. (Original.)

from the curves of cholesterol in the blood that the disturbance of cholesterol metabolism has apparently become corrected, the parietal sacculi are found to be changed in their general form. They seem to extend out into the wall; they are longer structures. We have attempted to show in Fig. 44, which is a schematic diagram, this difference in length; Fig. 44 is drawn from the normal animal in our collection which showed these structures most elaborately developed, on the left, and the same structures from a cholecystectomized dog, on the right. Fig. 45 is an untouched photograph of the structures after removal of the gall-bladder, with two normal injected ducts, using the same pressure and time. In many instances, the injected ducts of the normal animal, as in this photograph, look to the unaided eye like perfectly smooth tubes which show under the

microscope flattened sacculi. But the injected ducts from the animals whose gall-bladders have been removed show to the naked eye as tubes covered with excrescences, which give the ducts a sanded appearance.

Our work along this line is just begun and we do not wish to draw any too definite conclusion. Such an investigation must naturally include a study of many different species, both those with and those without gall-bladders.

This demonstration of the existence of normal structures along the bile-ducts with anatomical potentialities of gall-bladders which

FIG. 45.



Drawings from photographs of two normal extrahepatic bile-ducts of the dog (*A* and *B*), with the bile-ducts of a cholecystectomized dog (*C*). (Original.)

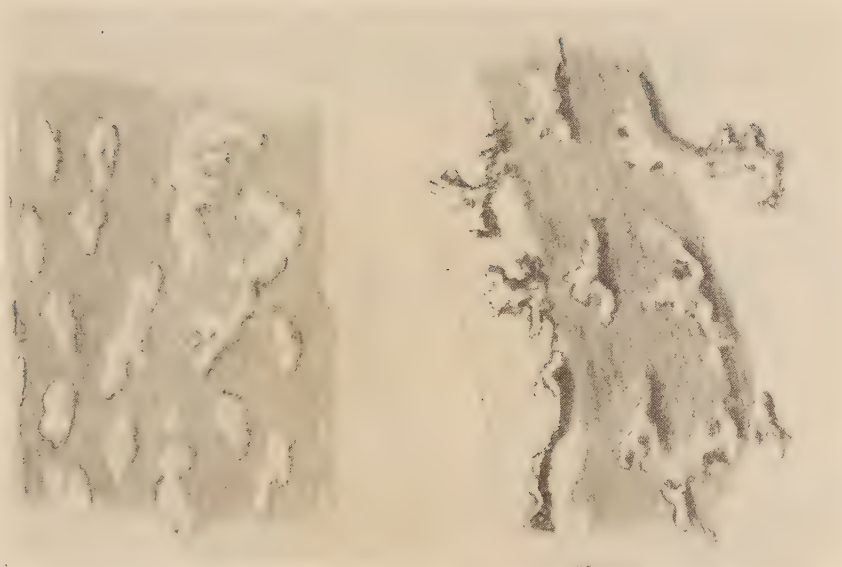
I have gathered for you from the literature; together with the suggestion I am able to offer that there is an hypertrophy of these structures after the gall-bladder has been removed, which is, I believe, altogether new, raises many questions in pathology and surgery. The coincidence of gall-bladder disease and bile-duct disease becomes evident—the same pathological process affecting the gall-bladder extends to these other gall-bladders along the ducts. And when this extension occurs the surgeon is confronted with this question, while it is perfectly simple to snatch the one large gall-bladder from its home, a home made unhappy by disease, it is true, what shall he do with the remaining million gall-bladders which are also made unhappy by the same disease process? Perhaps he had best keep the one big one which he can see and handle for drainage purposes.

What, then, do I think is the function of the gall-bladder? The

FIG. 44.

A

B



Schematic outline of normal sacculi (A), and the same structures after cholecystectomy (B).





manner of origin and development of the duct system of the liver indicates, I believe, that the membrane lining this system may be possessed of powers of absorption; the complex structure of the gall-bladder, the rich blood-supply, the unusual lymphatic supply, point to an absorptive function. The demonstration in lymph collected from the lymphatics of the gall-bladder of bile-pigments and bile salts, and of foreign salts introduced into the gall-bladder, proves that there is an absorption. The position of the gall-bladder, the provision of two valvular structures at its outlet, which are mechanically designed to permit inflow and to hinder outflow, lead me to the conclusion that under normal conditions whatever passes into the gall-bladder through the cystic duct never passes out again through the cystic duct. The demonstration of structures along the bile-ducts, which seem capable of taking over the function of the gall-bladder, indicates that the removal of the gall-bladder may not necessarily remove from the body the function of the gall-bladder. The bile contained in the gall-bladder is eventually absorbed, and in this process of absorption it would seem that an unknown something passes into the blood or lymph which has to do with the breaking up—the de-esterization—of the esters of cholesterol. The problem of the importance of this process to the body must wait for its solution until the day when we shall know more concerning the whole problem of the physiology of cholesterol.

It has been to me a real pleasure to collect for this Mütter lecture the half-forgotten work of old masters, and to revivify it by the work of more recent authors and by our own experiments. The most pleasant duty still remains to me, to thank the Committee in charge of the Lectureship, and through them the College of Physicians of Philadelphia, for the deeply appreciated honor.

## BIBLIOGRAPHY

<sup>1</sup> HAMMAR: *Anat. Anz.*, xiii, 1897, 233.

<sup>2</sup> BRACHET: *Jour. de l'Anat. et de la Phys.*, xxxii, 1896, 620.

<sup>3</sup> BROUHA: *Jour. de l'Anat. et de la Phys.*, xxxiv, 1898, 305; *Anat. Anz.*, xiv, 1898, 234.

<sup>4</sup> BROMAN: *Upsala läk. Förh.*, xxvi, 1921, Häft 5 och 6, Nr. vii; Festskrift tillägnad Prof. J. Aug. Hammar.

<sup>5</sup> RIETZ: *Nord. med. Arkiv.*, 1, 1917–1918, Häft 1, Nr. 2, 1.

<sup>6</sup> OWEN: Vol. i, p. 451, London, 1866, Longmans, Green and Co.

<sup>7</sup> FLINT: *Brit. Jour. Surg.*, x, 1923, 509.

- <sup>8</sup> HEISTER: "Compendium Anatomicum," Amstelodami, mdccxxiii, p. 240.
- <sup>9</sup> HENDRICKSON: *Johns Hopkins Hosp. Bull.*, ix, 1898, 221.
- <sup>10</sup> KEITH: *Lancet*, i, 1903, 639.
- <sup>11</sup> SUDLER: *J. H. Hosp. Bull.*, xii, 1901, 126.
- <sup>12</sup> SHIKINAMI: *Anat. Hefte*, xxxvi, 1908, 555.
- <sup>13</sup> BERG: *Nord. med. Arkiv*, Afd. i, (Kirurgi), 1, 1917-1918, Häft 3, Nr. 9.
- <sup>14</sup> BOYD: *Brit. Jour. Surg.*, x, 1923, 337.
- <sup>15</sup> BAINBRIDGE and DALE: *Jour. Physiol.*, xxxiii, 1905-1906, 138.
- <sup>16</sup> BEALE: "The Liver," 1889, 45, London, J. and A. Churchill.
- <sup>17</sup> LUSCHKA: *Z. f. rat. Med.*, iv, 1858, 189.
- <sup>18</sup> HARER, HARGIS and VAN METER: *Surg., Gyn. and Obstr.*, xxxiv, 1922, 307.
- <sup>19</sup> FREESE: *J. H. Hosp. Bull.*, xvi, 195, 235.
- <sup>20</sup> HENLE: "Handbuch d. Eingeweidelehre d. Menschen," Bd. ii, S. 207. Note: Braunschweig, 1862.
- <sup>21</sup> WAGNER: "Handwörterbuch d. Phys.," Bd. ii, S. 349; Braunschweig, 1844.
- <sup>22</sup> VIRCHOW: a. *Beiträg. z. exp. Path. u. Phys.*, ii, 1846, 83.  
b. *Archiv f. path. Anat.*, xi, 1857, 574.
- <sup>23</sup> ASCHOFF: *Münch. med. Wchschr.*, liii, 2, 1906, 1847.
- <sup>24</sup> POLICARD: *C. R. d. l. Soc. d. Biol.*, lxxvi, 1, 1914, 338.

# Progress of Medicine

## 1923

Collated by HENRY W. CATTELL, A.M., M.D.,  
Philadelphia,

AND

A. PARKER HITCHENS, M.D.,  
Major, M.C., U.S.A.

---

PROBABLY, the two most important and far-reaching events of 1923 upon the future practice of medicine in English-speaking countries, are the conditions which led up to the control of the English Government by the Labor Party and the present trend of the law courts in malpractice suits to demand from the general practitioner more and more abstract learning and to award larger and larger damages when present medical knowledge has not been used in the proper treatment of the plaintiff. And yet neither of these happenings in itself is strictly medical, but each shows the future course of medicine perhaps better than anything else.

"In every department of human affairs," wrote John Stuart Mill in his well-known work on Political Economy, "Practice long precedes Science." The important question of the hour to the physician is whether or not science as represented by the laboratory is as yet sufficiently practical and not now too costly for existing everyday conditions to take over the control of medicine for the good of the public welfare, for it must never be forgotten that the more highly endowed our hospitals become, the more must people in the industrial field in many parts of the world labor to supply the money with which to run the hospitals in their every increasing cost for maintaining each individual patient. The editorial office was recently visited by a foreign physician, who had great ideas of the wealth of America, to solicit our aid in an enterprise that would require at least two normal persons for the care of each moron, so that the morons might be properly educated! There must finally come a stoppage to expenditure, and the pendulum will swing to the other extreme as in the Russia of to-day, but let us hope not of to-morrow!

Here are two thoughts for consideration as to how far practice lags behind science or, as we think, too often pseudo-science. First, let not the sympathetic art of the practice of medicine and personal interest in the patient himself yield entirely to the cold, pragmatic laboratory side of medicine. One of our physician friends, so he tells us, recently had a painful injury to the hand, and his doctor, an excellent surgeon, decided definitely that there was no luxation and, in his opinion, no fracture, but as a precautionary measure he advised the taking of a skiagraph. Nothing was said to the one injured as to any treatment for the relief of the pain and swelling. So he next visits his friend, the well-known röntgenologist, who reports after the nurse had made four most beautiful X-ray plates that the parts are normal, and this ended their interest in the *patient* so far as they were concerned, but the pain and swelling are still there three months after the accident! Second, just as the static atom of the chemist of the nineteenth century has yielded to the dynamic atom of the 1924 physicist, so will the subconscious ego and the superconscious mind play a more and more prominent part in the medicine of the future. Practice will long precede science, and it is right and best that it should.

At no time in the history of medicine has the output of scientific work been so large or the means of diffusing printed knowledge by libraries, indices, abstracts, books and medical journals been so great. There are now in America special services for the supplying of medical information to their subscribers, such as the American Institute of Medicine, Pryor's Service and Tice's loose-leaf system. There are as well two most valuable indices of current medical literature, one the *Index Medicus*, published by the Carnegie Institute, and the other the *Quarterly Cumulative Index*, gotten out by the American Medical Association.

It is profitable at times to compare the medical present with the medical past, and with the object of putting mile-stones on the real progress of medicine we shall briefly do so.

Some thirty-five years ago when William Osler—it is now time to drop the Doctor, Professor and Sir, as they add nothing to his place in medical literature—was writing between one and two hundred unsigned editorials for the *Medical News*, of Philadelphia, he



discussed the still unsolved problems of the causation of cancer and the treatment of pneumonia and then just as now these problems appeared to be in course of being solved in the near future, while such topics as removal of brain tumors, pulmonary syphilis, bacteria in therapeutics, phosphorus in rachitis, dementia paralytica and syphilis, surgery of the lungs, Thomsen's disease, actinomycosis, correlation of tonsils and genitals, etiology of gastric ulcer, functions of the thyroid gland, intermittent albuminuria, alternating pyrexia in Hodgkin's disease, recovery in cirrhosis of the liver, epidemic cerebrospinal meningitis, vaccination against typhoid fever, Weil's disease, poisonous effect of petroleum, and so on, and so on, were elaborately handled as only an Osler knows how to do.

In the volume of the INTERNATIONAL CLINICS of ten years ago corresponding to this one, we find discussed such topics as social service in our hospitals, periodic examination of well persons,<sup>1</sup> treatment of leprosy by diathermy, origin of dreams, internal secretions, effect of emasculation upon the ductless glands, sensitized vaccines, Friedmann's vaccine, Abderhalden's serum diagnosis of pregnancy and the serodiagnosis of paternity, auricular flutter, vitamins and so on and so on. As to cancer the remark is made "The effort to discover the cause and cure of cancer is without a parallel in medical history," and concerning contract practice is stated "Our brethren in England shed bitter tears in anticipation of contract practice, and awakened one fine morning to the fact that practically one-half of the entire population was to be let out at so much per head, with the prospect of a great increase in their incomes over that of former days, and no more bad debts!"

So this leads up to our present article of the progress of medicine for 1923, and there is no better place to start with than the award of the present capitation fee of nine shillings, starting January first of this year, in Great Britain and Scotland and the financial condition of the London hospitals.

The Minister of Health in the Baldwin Cabinet approved the following terms of reference for the Court of Inquiry set up in con-

---

<sup>1</sup> Victor C. Vaughan writes in the same number on the "Importance of Frequent and Thorough Medical Examination of All Citizens," a paper which we advise everyone to read and immediately to act on if they are not doing so.

nection with the terms of remuneration for the insurance medical service in Great Britain and Scotland from January 1, 1924:

"To inquire and report to His Majesty's Government what should be the amount of the capitation fee (per insured person per annum) on the basis of which the Central Practitioners Fund under Article 19 of the National Health Insurance (Medical Benefit) Regulations, 1924, should be calculated as from the 1st January, 1924, so as to afford adequate remuneration for the time and service to be given by general practitioners under the conditions set out in these Regulations, in connection with the medical attendance and treatment of insured persons, due regard being had to the service in fact rendered under the Regulations hitherto in force.

"This capitation fee is not to include any payment in respect of the supply of drugs and appliances (such payment being made out of the Drug Fund under Article 24 of the Regulations), or any payments to meet the special conditions of practice in rural and semi-rural areas."

The Court of Inquiry was composed as follows: Mr. T. R. Hughes, K.C., Chairman of the Bar Council (Chairman); Mr. F. C. Goodenough, Chairman of Barclay's Bank; and Sir Josiah Stamp, K.B.E., D.Sc., and the Secretary to the Court was Mr. R. H. Crooke, Ministry of Health, Whitehall, S.W.1. Hearings were held, and all of those interested were allowed every opportunity to express their views as to the amount of the capitation fee to be allowed.

The master-hand of the Rt. Hon. Sir Clifford Allbutt, K.C.B., M.D., LL.D., F.R.S., Regius Professor of Physic, University of Cambridge, presented to the commission his views on contract practice, although he himself personally has had no direct experience therewith, in the following terms:

"I see no derogation in contract practice as such; the parson of the parish fulfills his duties by contract, and so do most public officials—town clerks, county court judges and the rest; everything depends on the fairness of the terms to both sides. We shall all be agreed that the doctor should give of his best to each and every patient, regardless of whether he be on a private or contract footing; no difference should be made, not even if the contract payment be insufficient. On any pretext, to grudge full time and attention to each several patient is demoralizing to the doctor and to the half-examined patient may be calamitous.

"'The half-examined patient'—here comes a grave difficulty; the time required for a full examination of a fresh case—let alone skill and elaboration—is at least double what it was fifteen years ago. Even the outward surgical cases take a longer time and are more exacting; far more knowledge is required, and more elaborate methods such as X-rays, tests for tubercle or syphilis, blood examinations and so forth—researches as necessary for the laborer as for the parson or the squire. Nature is no respecter of persons. If it be replied that the family doctor cannot do all these things, that indeed he has not the means

for them, the answer is that the means must be brought within his reach or the work can be only half done; although the general practitioner is not expected to be an expert at all points, yet he is expected to know what such resources are, what the indications for their use, and a good deal about their possibilities and method of application, so that he may advise upon them and even practise some parts of them. It is marvellous how much the modern practitioner can do and how various his resources; as marvellous as what he accomplished as a student, at a great cost in time and fees. Now all this means in practice much time, thought, and arrangement. Remuneration which may have been sufficient fifteen years ago has thus become inadequate; and in the long run, even among honorable men, scanty pay must bring about a lower grade of service. In writing to the *Times* (November 1, 1923) I said: 'The family physician must have gone through all special departments far enough to enable him to realize their bearings, to judge of their timeliness and efficacy, and so to advise his patient in the use of them. This requires, besides trained observation, tact, and probity, some skill over a vast range of study and instruction such as our fathers never dreamed of.' And the demands of science are growing day by day. I said also that 'a generation ago the doctor relied chiefly on observation; he was a naturalist rather than a scientist, and by practice mainly empirical. Medicine, then in the observational stage, is now being reconstructed on the methods of experiment. The advance of medical means and of medical knowledge, while retaining all that is good in the empirical tradition, and in the invaluable faculty of observation, has reinforced the whole system with a framework of science.'

"But it may be said that all this is overstrained, Utopian. Let him who says this visit the wards and the clinical laboratories—biochemical and pathological—of any well-equipped hospital; there he will find more than I can describe of these developments of the finer methods of diagnosis and therapeutics. Who will argue that all these things are too good for the contract patient? His doctor is expected to know about them and to conduct his investigations of each individual case in view of this knowledge and the possibility of its practical application. And this especially at a time when the cry is—and rightly is—that disease is to be detected and counteracted in its subtle beginnings. It is at this stage indeed that investigation takes most time and requires at least as high a degree of care and skill. One chief advantage of contract practice, or at any rate of some scheme of insurance, lies in the greater readiness of the insured to go to the doctor for lesser ailments which may be incipient stages of more serious maladies. We are becoming more aware of the need of detecting deviations from health in their earliest degrees, and of tracing out the beginnings of disease. On a system of payment by the visit many a man a little out of sorts will say it is not worth while troubling the doctor, or he does not like to 'look soft.' It is better that the visit should not seem to be an exceptional event, but a matter of routine in any indisposition. Many a man has saved himself from a tedious convalescence—for example, after an 'influenza,' or in a child slight rheumatic pains—by the prescription of a day or two in bed. But precaution of this kind, beneficent as it may be, will, of course, add to the percentage on the doctor's list and make for higher payments.

"If the further question be asked: 'What is a reasonable income for a general practitioner of medicine?' I cannot answer it save by comparison, the

comparison of work value. I do not hesitate to declare that a more costly education, more knowledge, more initiative, more versatility, are required for the practice of medicine, and are exercised in a far more intricate subject-matter, than for any other calling, and its remuneration should be no less; furthermore that all these are required from, and to-day are provided by, general practitioners in a higher degree than ever before."

The award was announced in the following terms:

"We, the undersigned being the Court of Inquiry appointed by a minute of the Minister of Health and the Secretary for Scotland dated the 12th December, 1923, have inquired into the matter mentioned in such minute and hereby report that the amount of the capitation fee per insured person per annum on the basis of which the Central Practitioners' Fund under Article 19 of the National Health Insurance (Medical Benefit) Regulations, 1924, should be calculated as from the 1st January, 1924, so as to afford adequate remuneration for the time and service to be given by general practitioners under the conditions set out in those Regulations in connection with the medical attendance and treatment of insured persons due regard being had to the service in fact rendered under the Regulations hitherto in force (such capitation fee not to include any payment in respect of the supply of drugs and appliances nor any payments to meet the special conditions of practice in rural and semi-rural areas) is nine shillings.

"In the course of the inquiry it was stated on behalf of the Minister of Health and the Secretary for Scotland and on behalf of the British Medical Association that our finding was only intended to be binding for the year from the 1st January, 1924, to the 31st December, 1924, but that both parties desired the Court to make a recommendation covering such longer period as we should think fit.

"We therefore recommend that the capitation fee of nine shillings so found by us should remain in force for a period of three years from the 31st December, 1924.

(Signed)

T. R. HUGHES.  
F. C. GOODENOUGH.  
GILBERT GARNSEY."

January 23, 1924.

This is a reduction of two shillings in the award of 1920, no one physician being allowed to have more than 2500 persons on his list. The *British Medical Journal* of February 2, 1924, expresses itself as well satisfied with the outcome of the award which is for one year, with the prospect of renewal for three years more, making four years in all.

The British Workmen's Compensation Act of 1923 came into operation on January 1, 1924, as well as the amended Merchant Shipping Act which covers the treatment of venereal disease in seamen so as to prevent concealment, neglect of treatment and spread of infection.



And how are the black-coated poor to be taken care of? Mr. E. W. Morris, house governor of the London Hospital, in submitting a toast at the dinner to further the objects of the British Provident Association in which Dr. Gordon Dill has shown so much interest, said, according to the *London Telegraph* of December 18, 1923:

The whole voluntary hospital system was in danger. The crisis was much more serious than was generally believed, and was not merely a question of post-war prices. It was due to the fact that in the last thirty years the outlook of the hospitals had entirely changed. Originally founded as shelters for the sick poor, they had now become, not alms-houses, but armories for fighting the diseases of the sick—both poor and rich—and the cost of a bed had crept up from 30s per week until now it touched £5. Hospital men were faced with certain definite alternatives. They could easily go back to “£2 per bed” by cutting off bacteriological departments, lowering the standard of the nursing staff, and so on; in other words, they could become lotuses, and careless of mankind. But that was a price they stuck at. They could close their beds; or they could become nationalized. If by nationalization they could fight disease better, by all means let that system be adopted; but, in view of their experience of the way in which nationalization had treated consumption, this was a method they were not prepared to recommend. Contributions by patients had been tried, but that system also had its drawbacks.

Those who had been thinking about the matter had decided that there must be some scheme by which the healthy could pay in small amounts, when healthy, to cover the cost, or part of the cost, of their treatment when ill. (Cheers.) That was the only way out of the present difficulty. For workers in the factory there had been founded the Hospital Saving Association, by which groups of workers with an average health rate received definite hospital services. The British Provident Association hoped to benefit those of the public who had been called the “black-coated poor”—the poorest of the poor to-day—the poor curate, the poor schoolmaster, and the poor city clerk. For a subscription which varied from one guinea per annum for a single person to a guinea and a half for a married couple and two guineas for a family, subscribers would receive, among others, the following advantages: Upon the recommendation of the patient's own doctor, the services which the hospitals rendered in research, massage, etc.; admission to hospital on the recommendation of a consultant, the association paying £4 per week towards the patient's cost to the hospital, or a similar amount if the institution selected were a nursing home; contributions for surgical appliances; payment of 3gs towards the fees of consultants; and payment for visits from the district nurse. If necessary the association would pay for treatment at the radium institute, and would also provide an ambulance service up to £1 per patient.

The chairman, Sir Alan G. Anderson, acknowledging the toast, said the problem was a perfectly simple one. The hospitals were a great health factory, and as they extended their expenses increased, as did those of every other factory. But their income did not increase proportionately. What they desired to do was not to check in any way the activities of those who aided the hospitals through charity, but so to organize “this health factory” that those who could afford to

pay towards the cost of their treatment were enabled to do so. What was aimed at was to secure the support of large city firms, who would introduce the scheme to their staffs—and perhaps follow the example of Sheffield, where 96 per cent. of the large firms supported the Hospital Saving Association, and it was regarded as a mark of local patriotism for the firms to find one-third of the total subscriptions. In the past the charge for keeping people healthy had been put too low down in the budget. It was a matter of simple organization and of getting people to put this cost at the beginning instead of at the end.

#### ABDOMINOSCOPY

Otto P. Steiner (*Surg., Gyn. and Obst.*, February, 1924) describes a practical method of endoscopic examination of the peritoneal cavity by a special instrument known as the abdominoscope, which is used like the cystoscope in the examination of the urinary bladder, the canal used for irrigating purposes being employed for the introduction of gas. The technic is as follows: A purgative is given the day before examination and one-quarter grain of morphine twenty minutes before puncture. The field of puncture is cleansed with benzine and then with alcohol and iodine. Local anæsthesia with novocaine is used, and it is a good plan to anæsthetize also the adjacent peritoneum to prevent sensations during examination. Usually the mid-line is avoided for the puncture, and a spot over the rectus muscle is selected for a stab incision through the skin. The puncture is done with the trocar inserted steadily and cautiously, and should always be made with the abdominal muscles contracted. To prevent deep entrance into the abdominal cavity, the trocar should be carefully steadied with the left hand while the abdominal wall is being penetrated. The trocar is removed and the abdominoscope is introduced along the tube which remains in the puncture canal. Then the tube is removed from the puncture canal for an air-tight closure. The abdominal cavity must be inflated slowly, the abdominal wall offering little resistance to the inflation. When the examination is finished, the air is allowed to escape slowly so as to prevent disagreeable sensations, and the endoscope is removed, with the hand placed flat on the belly to press out what air remains. The wound is then closed with one suture, swabbed with iodine, and a small dressing applied. The patient is up and about the next day.

Of first importance in performing abdominoscopy is the original position and the correct changes of the position of the patient. As

the air is of light specific gravity, it stays uppermost in the abdominal cavity. Therefore, through changes of position of the patient the air is capable of being placed in any position and thus displace the intestines at will. With the patient in a horizontal position, by moderate inflation, there is a full view of all organs in their normal relation under the abdominal wall. For an examination of the upper part of the abdomen, the patient is elevated, and for the lower portion, the pelvis is greatly elevated. When the puncture is made near the umbilicus, with the patient in the horizontal position, the greater part of the abdominal cavity can be looked over. The intestines and the omentum are usually found to be in one plane. The intestines show a hilly arrangement and peristalsis can be observed. One is able to see, on either side to the lateral abdominal wall, below to the symphysis, and above as high as the diaphragm. The nearness of approach to the different organs depends only on the length of the endoscope. Puncture above the umbilicus gives a surprising survey over the upper part of the abdomen when the thorax is elevated. The liver is so far away from the abdominal wall that the surface can be examined to a great extent. On the observer's left one can see as high as the vault of the diaphragm. The top of the gall-bladder, if not visible, can be demonstrated by turning the patient slightly to the right side so that the liver edge can be easily lifted by the abdominoscope, and gall-stones sounded for.

According to Steiner the value of abdominoscopy lies in its ease of application, its wide field of applicability and the marvellous results obtained through this direct, eye-controlled method of examination. Living pathology, now so available in animal experimentation, would appear to be at hand.

**ACNE, TREATMENT OF** See RÖNTGEN-RAYS

**ALCOHOL INJECTIONS FOR NEURALGIA** See NEURALGIA

**ANGINA PECTORIS, SURGICAL TREATMENT OF** See HEART DISEASE

**AUSTRALIAN X DISEASE** See EPIDEMIC (LETHARGIC) ENCEPHALITIS

**BASAL METABOLISM**

This important subject will be exhaustively treated in forthcoming issues of the INTERNATIONAL CLINICS, and will not be touched

upon here though much important work was done during 1923 upon basal metabolism.

**BAYER 205** See **TRYPANOSOMIASIS**

#### **BIRTH CONTROL**

The *Lancet* understands that the present attitude of the British Ministry of Health in regard to birth control is:

1. That the maternity and infant welfare centre should deal only with the expectant or nursing mother (and infant), and not with the married or unmarried woman contemplating the application of contraceptive methods.

2. That it is not the function of an antenatal centre to give advice in regard to birth control, and that exceptional cases in which the avoidance of pregnancy seems desirable on medical grounds should be referred for particular advice to a private practitioner or hospital.—Issue of December 29, 1923.

It will be most interesting to learn the policy to be pursued by Mr. Wheatley, the new Minister of Health for England and Wales.

#### **BITES OF ANIMALS**

*Centipede bites* are not usually fatal, as they occur chiefly on exposed portions of the extremities. As seen in the Philippines the local lesion usually presents two minute reddish punctures about two millimetres broad; a wheal soon develops at the site of the bite which increases in size until there is a large area of local œdema; pain and an itchy sensation develop immediately, later on are followed by numbness and formication. Lymphadenitis occurs a few days later, and does not subside for a week. These are the symptoms as given by Pineda (*Jr. Philippine Islands Med. Assoc.*, Manila, 1923, 3, 59) in reporting a case of a girl, seven years old, who was bitten on the right temple. Death occurred twenty-nine hours later, probably as a result of the proximity of the bite to the brain. The œdema was so pronounced as to completely close the right eye.

#### **BLOOD**

*Clotting Time of Blood.*—M. F. Peterson and C. D. Mills consider all of the numerous tests to determine the clotting time of blood to be unsatisfactory, this being due either to their complexity or the inaccuracy of the results obtained by them (*Arch. Ind. Med.*, 1923, 32, 188). The authors' test depends upon the fact that blood



ceases to flow back and forth in a capillary tube at the first sign of clotting. The only apparatus necessary is a capillary tube of 0.6 to 0.8 mm. inside diameter and  $1\frac{1}{2}$  inches long. The first drop of blood from the pricked finger or lobe of the ear is wiped off, and the second is made to flow into the tube by capillarity, leaving about one-sixth unfilled. The time of clotting is counted from the first appearance of the second drop of blood over the wound. The filled tube is then incubated by being placed in one of the creases of the operator's palm and completely covered by closing the hand, so that the blood will not become chilled. Observations are made every thirty seconds by gently inverting the tube and noting the time when the column ceases to move on being inverted. It has been found that with this method, when the observations are made under similar conditions, repeated readings do not vary more than twenty seconds.

*Mineral Constituents in the Blood.*—The calcium and phosphorus contents of the blood are assuming such importance in medicine as to demand a special article in the pages of the INTERNATIONAL CLINICS, and this will be forthcoming in the near future. Of the twelve Schüssler remedies which made up his biochemical system, three contained calcium and five, phosphorus. Many an investigator has been on the verge of making a great discovery, and has just missed the full import of his work, and on the other hand there has been many a good piece of work no doubt published in 1923 that will be rediscovered in future years. The best example of this latter truism that comes to one's mind is the work of Mendel on plant hybridization, published in 1865, and sometime before that of Darwin and Huxley.

## CANCER

*Heredity in Cancer.*—The conclusion that cancer in mice is inheritable according to mendelian principles has been reached by Maud Slye after twelve years of the most painstaking work. In this time 40,000 mice have been examined *post mortem*, and all lesions that might possibly be cancerous have been examined microscopically.

In a comprehensive review of the subject of cancer heredity Wells calls attention to the fact (*Jr. Amer. Med. Assoc.*, 1923, 81, 1017-1021; 1103-1112) that "all existing statistical evidence is valueless for any exact information on the subject, and it must

remain so until such time as we have necropsy records on all persons dying in several generations." Few persons have any knowledge of the cause of the death or of the serious illnesses of even their grandparents, to say nothing of their grand-uncles and aunts. Even if we did collect statistics based on physicians' diagnoses it is to be noted that, with respect to cancer, clinical diagnosis is wrong in anywhere from 20 to 50 per cent. of cases. This is true even to-day when we have so many more facilities for making accurate diagnoses than existed even two generations ago. How worthless, then, must be such statistics as those collected by Karl Pearson who is so constantly quoted in support of the argument that cancer is not hereditary.

While it is true, then, that accurate information cannot be obtained upon which may be based definite and correct deductions, there have been collected by numerous investigators evidence which points strongly to the inheritability of certain forms of cancer and new growths in special locations. Such instances as the occurrence of glioma of the retina as reported by Newton may be cited. In a family of sixteen children, ten had died of retinal glioma, the disease being bilateral in seven cases. Two of the others died in infancy and four were alive and well. Both parents were free from tumor but a brother of the father was believed to have died of the same disease. Other "glioma" families have been recorded. Among other tumors which have so frequently affected certain families as to have made them noteworthy may be mentioned melanosis of the choroid, fibro-adenoma of the breast and primary cancer of the liver. To these may be added certain benign new growths of which several records have been collected. Hereditary telangiectasis is well known; multiple benign cystic epithelioma has a distinctly familial distribution. Another form of benign neoplasm with a marked hereditary character is multiple cartilaginous exostosis. Von Recklinghausen's disease or multiple neurofibromatosis has a most strikingly hereditary character. Possibly of some relationship to this is the central nervous sclerosis associated with symmetrical adenoma sebaceum.

Using the material collected by field workers of the Eugenics Record Office at Cold Spring Harbor, Levin has made the only study of heredity in human cancer in which the mendelian principles of heredity are considered. It was his conclusion that resistance to

cancer is a dominant character, the absence of which creates the susceptibility to cancer.

Since the demonstration by Leo Loeb and by Jensen of the inoculability of certain rat and mouse tumors, efforts have been made to introduce experimental study of the influence of heredity on inoculated tumors. That the use of such material can yield information of little value in this direction is realized when it is remembered that the inoculated cancer is fundamentally different from spontaneous cancer in that the transplanted tumor is never a growth of the cells of the inoculated animal but it is a growth of the cells descended from the mouse or rat that furnished the original spontaneous tumor from which the transplanted growth was obtained. "For example, a mouse inoculated with a strain of the Jensen carcinoma, which has been carried through myriads of generations of transplants during the twenty and more years since Jensen first started the transplantation, is growing a tumor composed of cells derived from Jensen's original tumor mouse and not from its own tissues. The mouse bearing an engrafted tumor is merely furnishing the soil on which some grafted tissue is growing, exactly as a culture tube furnishes a soil on which bacteria are growing."

Successfully inoculated tumors often disappear spontaneously, and immunity may be induced by various procedures. Notwithstanding these differences, certain facts of interest from the standpoint of heredity have been elicited. For instance, animals closely related to the one from which the tumor is derived are more favorable for inoculation, and the chances for success become more and more remote the greater the differences in origin and character between the inoculated mouse and that in which the tumor originated. The growth of a transplantable tumor for several generations in animals of a particular type may enhance its virulence for that strain of animals but not for others. Certain strains or families of mice belonging to the same species show differences in susceptibility to inoculation. Haaland found that a certain tumor would grow in nearly 100 per cent. of Berlin mice; in 24 per cent. of Hamburg mice; made inoculations into hybrids; for instance, he crossed Japanese

In order to study more accurately the influence of strain, Tyzzer mice, but in practically none of Christiania mice.

waltzing mice with common mice. His studies led him to the belief that both susceptibility and non-susceptibility are inherited as a complex of mendelizing factors, perhaps as many as twelve or fourteen in number. Similar work by others has in general agreed that heredity plays a large part in susceptibility to inoculated cancer but the number of mice used and especially the number of generations studied have not permitted the drawing of accurate conclusions concerning the character of the inheritability.

While such studies elicit facts of great scientific interest it is the observations on spontaneous tumors in mice that have led to conclusions which may be directly applicable to the development of cancer in human beings. Loeb and Lathrop made observations upon a stock of mice in which spontaneous tumors were found almost constantly, the rate, however, varying with different strains. They concluded that heredity is undoubtedly an important factor in determining the incidence of cancer, for strains of mice can be established in which the incidence rate may be as high as from 58 to 65 per cent.

The most extensive and carefully controlled investigation of the influence of heredity on the development of tumors in mice, however, has been performed by Maud Slye. Her observations have been upon a stock of mice whose ancestry for many generations is known. They are all the descendants of a limited and carefully selected stock bred together according to definite plans designed to give evidence as to the influence of heredity on the incidence of spontaneous tumors in mice. In this stock there are strains of mice in which cancer is very common, strains in which it never occurs, and strains of intermediate character. None of these mice is used for any purpose which might modify its resistance; that is, the mice are not used for inoculation or operation or for any other experimental work. Every effort is made to enable the mouse to reach a maximum age. Great care is taken to keep out epidemic infections. This work has been continued now for more than twelve years and up to the present more than 40,000 mice have been examined *post mortem*, and all lesions that might possibly be cancer have been examined microscopically by Gideon Wells or Harriet Holmes. Every dead mouse, whether cancerous or not, is thoroughly investigated. Undoubtedly the age to which the mice in this stock attain permits the development



of cancer in a larger percentage than would be seen in ordinary stocks in which the age limit is considerably less.

Some of the results of this work are as follows:

"Cancer in mice appears in most of the forms seen in man, and in far greater variety than had previously been supposed."

"The tendency to develop cancer, or the capacity to resist cancer, is unquestionably increased by heredity. Strains have been established in which in many hundreds of individuals, through as long a period of observations as twenty-five or thirty generations, not a single case of tumor growth has been seen. Also strains have been established in which the occurrence of cancer is so common that it becomes the sole cause of the natural death of the animals."

"The resistance to cancer in these mice behaves in breeding, in Slye's experiment, like a typical mendelian character. The susceptibility to cancer behaves as a mendelian recessive. When a cancer mouse, derived from the crossing of cancer mice, is crossed with a mouse free from cancer and derived from ancestors that never have shown cancer for many generations, the resulting hybrids of the first generation never show cancer. If such hybrids are bred together or with other hybrids of similar ancestry, cancer will appear in the offspring in mendelian proportions, and strains of (1) pure cancer mice, (2) pure cancer-resistant strains, and (3) heterozygous strains can be extracted, exactly as with any other inheritable 'unit character.'"

"It is, of course, quite to be expected that susceptibility to cancer should be a recessive character; for, if susceptibility were dominant, cancer would be far more prevalent than it is. The usual statement that a deleterious dominant factor eliminates itself by destroying the species in which it occurs does not hold for cancer, since this disease does not usually manifest itself until after the reproductive period is almost or entirely completed."

With regard to the bearing of animal experiments we have to consider the fact that cancer in mice is in all respects identical with cancer in man.

It is well known that the principles of inheritance are the same for all animals as well as for plants and since cancer in its fundamental aspects is the same in man as in other mammals the drawing of conclusions in respect to heredity and human cancer from observations on experimental animals is justifiable. There is evidence also which, while not thoroughly reliable and conclusive, supports the inference that in man susceptibility to cancer behaves as an inherited recessive character.

#### CARBON TETRACHLORIDE

Under the misleading title of "Report of Three Autopsies following Carbon Tetrachloride Treatment," J. F. Docherty and Lucius Nicholls (*Brit. Med. Jr.*, October 27, 1923, p. 753) describe

their treatment of three condemned prisoners with small doses of this valuable anthelmintic, which when pure seems to be attended in its administration for hook-worms with no more danger, but with better results, than when thymol is employed. After paying the penalty of death for their crimes, post-mortem examinations were made on the prisoners. In two cases the intestines were removed in three sections after double ligatures had been applied; the sections were opened and washed separately to determine the number of free and attached parasites in each. Each prisoner received 4 c.c. of carbon tetrachloride, followed in two hours by 2 oz. of saturated Epsom salt solution. No food was allowed previous to treatment except in the case of No. 8925, who by mistake received his ordinary breakfast at 6 A.M., and was treated at 10 instead of 8 in order to permit the passage of the food into the intestines. One and a half hours after the administration of the salts they were allowed tiffin.

Prisoner 8925 received 4 c.c. carbon tetrachloride at 10 A.M. on February 21st, the salts at noon, and had tiffin at 1.30 P.M. The number of worms counted in the first twenty-four hours was: Hook-worms 101 (male 38, female 63), ascaris 1, oxyuris over 1000. In the second and third periods of twenty-four hours no worms were found. The man was executed on February 24th. In the contents of the large intestine two oxyuris and two trichuris were found, and attached to its walls nine trichuris and twelve oxyuris. In the lower two-thirds of the small intestine three ascaris were found in the contents and one ascaris and one trichuris attached. Two ascaris were attached to the duodenum and upper third of the small intestine. Prisoner 8937 received 4 c.c. carbon tetrachloride at 8 A.M., the salts at 10 A.M., and had tiffin at 11.30. During the first twenty-four hours one hook-worm (female) was found and one oxyuris. In the second and third periods of twenty-four hours no worms were found; he was executed on February 24th at 8 A.M. In the contents of the large intestine eight hook-worms (six male and two female) were found and two trichuris. Three other trichuris were attached to the walls. In the contents of the lower two-thirds of the small intestine one ascaris was found, and two trichuris attached to the wall; no worms were found in the duodenum and upper third of the small intestine. Another prisoner, 8992, received 4 c.c. of carbon tetrachloride, but in his case the worms were not counted, nor were the intestines examined. None of the prisoners made any complaint.

Sections of the organs were stained with osmic acid according to the method of Marchi. Sections also were stained by hæmotoxin and eosin.

No. 8925.—The liver showed fatty degeneration, many of the cells containing fat globules; the largest of the globules measured about 10 microns. The kidney

cells contained a few globules of fat. The spleen was greatly enlarged and showed pigment and fibrotic changes due to numerous attacks of malaria.

No. 8937.—The liver showed slight fatty degeneration, the kidney no recognizable changes.

No. 8992 showed no changes in liver or kidney.

*Conclusions.*—(1) A dose of 4 c.c. of carbon tetrachloride given as in the above cases may produce fatty degeneration of the liver.

(2) Although numerous fat globules may appear in the liver cells apparently as a result of the administration of carbon tetrachloride, the changes in the liver are of a temporary nature and do not appear to contra-indicate the use of the drug, because many patients have been treated with much larger doses and have not complained of any discomfort other than very slight giddiness, nor have symptoms or signs of ill health arisen in them. Further, many hundreds of school children have received doses of carbon tetrachloride, and in no case has any sign of ill health occurred subsequent to treatment.

(3) In case No. 8925 the changes in the liver were so marked that we would have expected signs of marked ill health during life, but these were absent; consequently it appears that much fat (presumably derived from fatty degeneration) may appear in the liver and yet be a matter of small importance as concerns the health of the patient.

Lambert (*Medical Science*, Abstracts and Reviews, 1923, 9, 91), medical officer of the Bureau of Ankylostomiasis, in the colony of Fiji, states that 42,000 persons were treated by the Bureau without any ill effects from the drug, but that among 8000 cases subsequently treated with supposedly pure carbon tetrachloride three deaths occurred. A chemical examination, however, showed that this particular lot of carbon tetrachloride was impure. Lambert employs a dosage of 0.2 c.c. to the year of age up to 15, when the adult dose of 3–4 c.c. is reached. Much higher doses have been used by Leach, of Manila, who records the case of a condemned criminal on whom carbon tetrachloride in 10 c.c. doses produced no ill effects, as could be seen from examination of the liver and kidneys made after his execution. The same observer found that 12 c.c. of carbon tetrachloride removed all hook-worms and ascarides, but that the drug had apparently no effect on trichurides and oxyurides. Lambert, as the

result of his extensive experiences, comes to the following conclusions: (1) Carbon tetrachloride is the best vermifuge for the treatment of the disease in a country where *Necator americanus* predominates. (2) The drug is palatable, requires no preparation of the patient, and when pure is apparently non-toxic. Nicholls and Hampton, who employed the drug in the treatment of hook-worm disease in Ceylon, summarize its advantages as follows: (1) It may safely be administered in doses of 10–20 minims to children of three and four years, even when they are seriously ill from other causes. (2) It does not seriously deteriorate on keeping. (3) It is more valuable than chenopodium for campaigns against hook-worm disease, because (*a*) patients do not object to its taste; (*b*) it is not necessary to precede or follow its administration by a purge; (*c*) it is more efficient than chenopodium, and has not its distressing effects; (*d*) it is much cheaper than any other drug that has been used; (*e*) it can be prepared in a high degree of purity and a chemically pure preparation should always be used; (*f*) the person treated can do his ordinary day's work.

#### CISTERNA MAGNA

*Puncture of the Cisterna Magna.*—That puncture of the cisterna magna, the space between the arachnoid and the transverse fissure of the brain, is a procedure which, while potentially dangerous, may be performed safely, has been shown by James B. Ayer (Report on 1985 Punctures of the Cisterna Magna in the *Jr. Amer. Med. Assoc.*, 1923, 81, 358). He has treated 450 patients by this method, one patient having received twenty-six punctures, while several others have been given more than ten injections of serum by this route. Puncture of the cisterna magna may be considered as a means for obtaining cerebrospinal fluid when it is impossible, or inadvisable, to secure it by any other route or when the cerebrospinal canal is partially or completely obliterated as in cerebrospinal meningitis. Various forms of serum may be administered by this route or cerebral syphilis treated by mercurial or arsenical preparations. It is sometimes possible to withdraw fluid by puncture of the cisterna magna in certain conditions resulting in intracranial pressure such as hemorrhage following fracture.



## CODE OF ETHICS

*The Old Doctor and the Young.*—The Hippocratic Oath makes very definite mention of the duty of the young physician to the preceptors who have guided his steps through the difficult course of medical education. It must have been the widely different conditions of medical practice in those times which prompted the omission of some similar comment on the duty of the older doctor to the novitiates in the profession. The organization of hospital services at the present time affords the established physician a very fine opportunity to aid his younger colleagues. The chief of a service, to a great extent, holds the destiny of his staff in his hands. First and most apparent, of course, is the principle that the recognized doctor must in word and fact, in every way, avoid any financial competition with his young confreres. The economic situation of the tyro in medicine is perilous at best, and it is disloyalty of the grossest sort for the established doctors to set their fees at such a standard as to cut in on the practice of the young man. For those who need his services and cannot pay, the recognized doctor is always willing to give them at the dispensaries, free. At his office, in private practice, he must not compete with the young man. Though the financial aspect is certainly important, the question of scientific aid and assistance is no less so. The chief of service should make it his personal duty and responsibility to watch over the scientific progress of the men on his staff. He should set high standards of work and see that they are kept high. He should give out scientific problems to be solved and encourage and stimulate initiative in research and original work. Above all, he should dispel rivalries and jealousies on his staff and, by his own example, foster the rare qualities of loyalty, sincerity and steadfast adherence to the ethics of their common profession. It is through such coöperation on the part of the older doctors that the fine traditions which have governed medicine in the past will be maintained. The same spirit will hold our scientific standards high. —*New York Medical Week*, September 22, 1923.

## DEATH

*Sudden Death from Trivial Causes.*—According to W. G. Aitchison Robertson (*Practitioner*, Lond., 1923, 111, 110) it is not

wise to express an unqualified, favorable prognosis when undertaking even trivial operations or when treating slight injuries or trifling illnesses. A strong, healthy looking individual may die while under an anæsthetic, while having a boil lanced, during the passage of a catheter, or there may be failure of the heart beat during the simple tapping of the abdomen for ascites. Many causes result in shock in which death may occur immediately from inhibition of the medullary and basal ganglia. These exciting causes may be psychic in character, such as the emotions of joy, fear, anger and anxiety. As other causes of sudden death may be mentioned rupture of an aneurysm of the aorta on slight exertion, especially while at stool, rupture of an extra-uterine gestation and an unrecognized apical pneumonia. A hypodermic of morphine administered to a patient with unrecognized Bright's disease may be followed by sleep, coma and death.

#### "DEVIL'S GRIPPE"

*Epidemic Transient Diaphragmatic Spasm.*—Payne and Armstrong (*Jr. Amer. Med. Assoc.*, 1923, 81, 746) describe a curious affection in Virginia reaching the proportions of an epidemic in May or June, 1923, which seems to be a return of a similar condition which began in June, 1888, and to which they gave the name of epidemic transient diaphragmatic spasm. William C. Fowler, health officer of the District of Columbia, describes the symptoms as follows:

"The onset is usually acute, with a chill or chilly sensation; the temperature rises rapidly and may reach 101 to 104 degrees. Profuse perspiration is generally present. There is severe epigastric pain, which frequently spreads to one or both sides of the chest, especially in the region of the ninth rib; tenderness is often present in that region. The respirations are markedly increased, and frequently reach 40, 60 or more a minute. This increased respiratory rate is explained by the intense pain caused by deep inspiration, the patient breathing very shallow in an effort to relieve the pain. Headache is said to be present in about 50 per cent. of the cases and nausea or vomiting in about 33 per cent. Constipation is the rule, although in some instances diarrhœa is present. Rigidity of the abdominal muscles is also common, and pain on movement of the body is present in many cases. The duration of the attack is usually three or four days, and the period of incubation of the disease is believed to be about the same. While the great majority of the victims are under twenty years of age, older persons are not altogether immune from attack."

Almost simultaneously, an epidemic was being studied by Hanger, McCoy and Frantz at the Presbyterian Hospital in New York City (*Jr. Amer. Med. Assoc.*, 1923, 81, 826). Beginning in June, 1923, sixteen patients were admitted to the hospital, all presenting symptoms so similar to one another and with clinical courses so nearly identical the conditions seemed a new and distinct clinical entity, and one not corresponding to any description in the literature. Absence of marked prostration seemed to rule out influenza, dengue and sand-fly fever. There were no definite physical signs and the only laboratory findings were transient leucocytosis and slight hæmaturia. The characteristic features of the New York epidemic which the authors have called "epidemic pleurodynia" make it seem identical with the epidemic occurring in Virginia as described by Payne and Armstrong. These features are: (1) Occurrence in the young, the average age being thirteen years; (2) sudden onset; (3) pain, always an initial symptom, referred to the chest or upper abdomen and usually localized to one side; (4) rather high fever with few other general constitutional symptoms, fever averaging 103° F.; (5) disappearance of the pain and fever within twenty-four hours, but frequently recurring on the third or fourth day after the onset; (6) an uncomplicated and speedy recovery.

#### DIABETES See also INSULIN

*Blood-sugar Standards in Normal and Diabetic Persons.*—Horace Gray (*Arch. Int. Med.*, 1923, 31, 240–262) has studied the standards of blood-sugar response to carbohydrate intake on the basis of more than 900 curves and 4000 individual determinations. He finds that the fasting value in 431 apparently healthy persons averaged 0.09 per cent. of blood-sugar. The unusual figures, however, of 0.02 to 0.16 were reached in as many as 7 per cent. of these normals, thus leading to the alternatives: Clinical judgment of normal metabolism is untrustworthy, or a considerable number of normals exhibit suspiciously large fasting figures. The statement that normal persons do not have sugar in the urine after eating 100 gm. glucose is disputed on the ground of evidence here collected that in 129 curves glycosuria was noted in 40 per cent. This astounding discovery would be even more extraordinary—and reassuring in prognosis—if the

urine had been examined at the time of each blood-letting instead of only once as was so often the case, if examined in all the 300 curves instead of only 129, and if the after-histories of these subjects were known ten years later.

The normal postprandial curve averaged 0.14 (one-half hour), 0.12 (one hour), 0.11 (two hours), and 0.09 per cent. (three hours). The average acme of 0.14 per cent. was lower than the value usually postulated as the upper limit of normality, namely, 0.16 per cent. A normal zone for the glycaemic reaction stands out graphically: From 0.11 to 0.16 per cent. no matter whether the dose of dextrose varied from 20 to 200 gm. Loads of less than the usual 100 gm. stimulate adequate reactions, and have the presumptive advantage of avoiding the damage which is both possible theoretically and, in fact, suggested by the annual glucose tests reported by Ohler. A suspicious zone of high normal reactions appears wider than currently visualized. For values from 0.17 up to 0.28 per cent. occurred frequently, namely, in 17 per cent. of the analyses after 100 gm. glucose.

Concern is primarily aroused in diabetes when the fasting blood-sugar is 0.11 per cent. or less, for when that level is exceeded, a curve is superfluous and possibly an insult to an injured function.

Let us not forget, says Gray, the warnings indicated by the work of Kawachi, of Martius, of Allen, and of Ohler. Kawachi said that the surprisingly great frequency of more or less enduring functional damage by a single overstrain of the sugar-utilizing power has been overlooked by failure to continue regular tests for a time after the first disappearance of the glycosuria. Out of the forty persons without metabolic disease reproduced by Martius, the glycosuria after from 25 to 200 gm. glucose lasted in 40 per cent. ten days, or longer, even twenty-nine, thirty and thirty-two days.

F. M. Allen's statement is: "In the early stage, glucose is more powerful than starch in producing diabetes, and animals which are progressing toward complete recovery on starch diet can be sent into hopeless diabetes by admixture of glucose." (*Jr. Exper. Med.*, 31, 381, 402, 1920.)

Ohler has reported several cases in which glucose-tolerance tests were done three times at intervals of about one year. In Case IV (M. C.) the progressive fall of tolerance may, indeed, be due to her



free diet, but, on the other hand, it may also be ascribable to damage by the glucose load. (*Med. Clinics N. Amer.*, 5, 1465, 1922.)

In cases with normal fasting blood-sugars appalling postprandial peaks are seen, even 50 cg. per 100 c.c., thus manifesting the imprudence of denying diabetes because the fasting figure is eleven or less. For treatment such a finding is encouraging, since we want to know the best blood-sugar attainable. For diagnosis, on the other hand, we wish the worst blood-sugar of the twenty-four hours, and accordingly should secure the blood half an hour after the test load.

From Table 5 of Gray's work it is manifest that: (a) Hyperthyroidism must be excluded before interpreting high sugar curves as indices of diabetes; (b) that the average lines exceed normal averages by a smaller margin than was anticipated from reviewing the conclusions of other writers who have studied individuals, while the maxima for hyperthyroids even fell short of the maxima for normal; (c) that thyroid patients clinically improved by operation show glycaemic reactions not only normal but rather low normals. Evidence as to changes in body-weight after operation might be instructive.

Newburgh and Marsh (*Arch. Int. Med.*, April, 1923) have induced an aglycosuric state in a large group of patients on a diet of 900 calories made up of low protein, low carbohydrate and high fat values. The diet was not attended by acidosis, the nitrogen balance was maintained, aided hyperlipoidæmia and did not cause it, and avoided the evils of under-nutrition by fasting.

*Odd Carbon Fats in the Treatment of Diabetic Ketosis.*—Max Kahn (*Amer. Jr. Med. Sci.*, December, 1923) states that natural fats are all glycerides of the fatty acids containing an even number of carbon atoms, which during abnormal breakdown yield butyric acid and the ketone substances of diabetic ketosis. A palatable, synthetic, odd-carbon fatty-acid fat has been prepared by Kahn, of which about 90 per cent. is catabolized in the body of diabetic patients without the production of ketones, and therefore may be fed to diabetics *ad libitum*, with the allayance of hunger and a frequent increase in their weight. In one case reported where the administration of insulin had had absolutely no effect on the presence of the glycosuria or stopping the loss of weight, the eating of this partially predi-

gested fat cleared up the acetone, and during a period of several months she gained ten pounds in weight.

## DIPHTHERIA

*The Schick Test and Active Immunization.*—R. A. O'Brien, A. J. Eagleton, C. C. Okell and Miss M. Baxter (*Brit. Jr. Exper. Path.*, Lond., 1923, 4, 29–33) give the following table and the results of their use of the Schick test:

Adults	Number tested	Percentage negative
Medical students—a London teaching hospital.....	160	35
Nurses—a London teaching hospital.....	48	49.5
Nurses—School A .....	182	78
"    "    B .....	59	74
Children		
School B .....	739	72
"    C .....	329	69
An institution for children.....	1046	62
Good class private school.....	53	28
Infant welfare centre.....	153	24

"The results closely resemble those obtained elsewhere, the groups from a 'higher' social stratum showing a lower degree of immunity than those from a 'lower,' while the children, mostly aged from one to five years, from the infant welfare centre came from a district in which there has been but little diphtheria for some time past.

"Apparently the children of the well-to-do are carefully guarded in their early lives, and escape the chance of the frequent mild attacks of unrecognized diphtheria, which would otherwise eventually cause them to become immune. In a similar manner the children of intelligent artisans who live in well-kept homes in a district where few cases of diphtheria have occurred in recent years 'escape' or 'avoid' natural immunization.

"*Age Distribution.*—Our general results agree with those reported in the literature, the immunity rate rising during the years of childhood and becoming constant in early adult life. The deviations in each individual group are associated with the special conditions of the group, or in some cases are probably due to the smallness of the statistical units.

"*Familial Immunity.*—As observations accumulate it may become possible to decide whether there is a family factor in the readiness with which immunity is developed. Unfortunately the observations hitherto recorded are insufficient to throw much light upon this point. When immunizing 107 families, we found in twenty that the children were positive reactors; in fifty-four all negative; in twenty the older negative and the younger positive in accordance with Zingher's observations; and in thirteen (12 per cent.) the older children positive, while the younger were negative. The members of these thirteen families did not live together during the whole of their lives.

"In one group of 136 children, all of whom originally gave a Schick-positive reaction, there were only three individuals who failed to give a negative Schick reaction within eleven weeks of the commencement of the 'immunization'; of these, two were brother and sister, and both proved refractory until twenty-one weeks had elapsed. The remaining one was still Schick-positive after this interval.

"*Twins.*—We tested three pairs of twins; each twin gave the same reaction as the other in two cases; the twins were similar and less than three years old. Of a third pair of dissimilar twins, aged seven years, the boy was a positive reactor and the girl negative."

*Toxic Effects of Diphtheria and Other Infectious Diseases upon the Nervous System.*—The susceptibility of various elements in the nervous system to the poisons produced in the course of infectious disease and the mechanism through which the nervous system is attacked by specific bacterial poisons when completely elucidated will go far toward the solution of many of the other problems connected with the production of symptoms. Interesting observations were made by Walshe concerning the localization of paralyses following faucial and extra-faucial diphtheria. While on duty with troops on the Palestine fronts during the years 1917–18 he had the opportunity to study clinically an epidemic in which there seemed to be an unusual number of localizations of the infection in various parts of the body. In an appreciable percentage of cases in which the infective focus was single and not multiple the initial paralysis corresponded anatomically with the site of the focus.

With the preparation afforded by these observations Walshe has most interestingly and briefly reviewed the whole question of the action of poisons upon the nervous system. (*Med. Sc., Abstrs. and Rev.*, 1924, 9, 267–272.)

Guillian has recently published a volume entitled "*Études Neurologiques*," and in this are reprinted five papers written in collaboration with Laroche and Grigaut on the fixation of poisons in the nervous system, dealing mainly with the fixation of diphtheria toxin. These papers appeared originally between the years 1909 and 1911 but for some reason they did not attract the attention they actually merited. Their reappearance is considered timely for since then much pathological and clinical work has been done which confirms the essentials in these pioneer investigations.

Guillian and Laroche found that nervous tissue has the power of fixing certain poisons, one factor at least in the fixation being a

physicochemical one. As a result of chemical examinations of brain tissue treated with diphtheria toxin it was learned that an ethereal extract contained the bulk of the fixing substances and that the portion left after extraction with alcohol, ether and chloroform had no fixing power. They conclude, therefore, that the toxin forms a complex with the phosphorized lipoids of the brain and the toxin combined with these lipoids seems to be increased in its potency. Tetanus toxin, on the other hand, is fixed by the protein constituents of the nervous system and is associated with a certain amount of neutralization. Studies with strychnine, cocaine, mallein and other substances of toxic potency revealed a similar selective fixation by different chemical elements in nervous tissue and this selectivity reveals corresponding differences in anatomical distribution of the poisons in question within the nervous system. The symptoms of intoxication depend, therefore, as much upon the distribution of the poison within the nervous system as upon its specific action. According to Guillian and Laroche diphtheria toxin reaches the central nervous system along the nerves innervating the infective focus by a process called by them "ascending neuritis." Upon reaching the neuraxia it tends to become fixed by the phosphorized lipoids which are most abundant in the gray matter. In faucial diphtheria the motor nuclei in the floor of the fourth ventricle are involved—mainly the glosso-pharyngeal-vagus-accessorius complex. As the toxin accumulates in this region it tends to spread throughout the nervous system by interstitial channels resulting in the clinical picture spoken of as multiple neuritis. The observation of Walshe noted above upon the localization of post-diphtheritic paralysis according to the part of the body infected, together with observations by others along the same line tend to confirm the views of Guillian and Laroche with regard to the local paralysis. It is not so certain, however, that the multiple neuritis is parallel with the result of a perineural conduction of toxin to the central nervous system from the infective focus. The toxin circulates in the blood and thus gives rise to the cardiac involvement of diphtheria which is directly myocardial and not as was formerly believed due to vagus neuritis. Toxin may therefore reach the nervous system by this channel also. The symmetry and widespread distribution of the generalized group of symptoms point to



this conclusion rather than to the view that the spread of toxin is entirely from the local nervous lesion by interstitial channels within the central nervous system. If this is true then diphtheria is an example of both lymphogenous and hematogenous intoxication of the nervous system. Much work remains to be done along these lines but it is exceedingly interesting to see how the pathology of diphtheria as it effects the nervous system has been brought into line with that of tetanus and rabies. Three factors determine the nature of the clinical manifestations in any poisoning of the nervous system: (1) The path of entry, (2) the selective fixation of toxins about certain elements within the nervous system, and (3) the specific action of the poison upon the nervous tissue.

#### DRUNKENNESS

*Tests for Drunkenness.*—In 1921 Denmark passed a law fathered by the Danish Medico-legal Society permanently to cancel the licenses of those motorists convicted of drunkenness while driving a motor vehicle. This led to the formulation by the society, in coöperation with the police, of a series of clinical tests for drunkenness and for simply being under the influence of liquor which do not include the finding of alcohol in the blood or urine and which only takes up about three-quarters of an hour in going over each case. Quoting from the *Journal of the American Medical Association* for October 6, 1923, the following guide is given to be followed by the police surgeon in determining whether or not the motor driver is intoxicated:

(1) Observe the driver's appearance. Drowsiness, drooping eyelids, relaxed features, congestion of the face and conjunctivæ, sweating, slobbering, disordered dress and the like should be noticed.

(2) Observe his behavior. Noisiness, silly behavior, excitation, garrulity, restlessness and other characteristics should be noticed.

(3) Is his sense of time and space natural? If it is, say "Yes"; if not, repeat his statements.

(4) Test his memory. Note if he can remember a couple of addresses, and test his ability to describe something, *i.e.*, how the motor accident happened, or the meaning of a drawing in an illustrated paper. Have him perform some simple tests in arithmetic, and other tests showing mental and physical coördination.

(5) Note his speech; is it thick, nasal, lisping or stammering? Let him repeat difficult words or read aloud a short notice in a paper.

(6) Note his gait. Swaying and ataxia should be noticed, and Romberg's test should be carried out.

(7) Test the movements of his hands and also his handwriting, telling him to write his name, age, station in life and address on a sheet of paper.

(8) Note if his pulse is regular and rapid, the condition of his pupils and his response to painful stimuli.

(9) Note if he smells of alcohol.

(10) Are there signs of other diseases, such as epilepsy and apoplexy?

We have found Quinquad's sign of value in determining whether or not a man is a drunkard. This consists, according to "Lippincott's Medical Dictionary," of a series of shocks felt, or heard with the stethoscope in rapid succession several seconds after a drunkard places the tips of his fingers of his spread hand perpendicularly upon the examiner's palm. The elicitation of this sign would not, however, be proof that the person was intoxicated at the time of the examination, but would be strong evidence that he was addicted to the use of alcohol.

#### DYSMENORRHEA

*Dysmenorrhœa from the Industrial Viewpoint.*—Margaret Castex Sturgis, of Philadelphia, from a study based on 2077 recent, consecutive physical examinations of women employees in a large department store which maintains an average working force of about 3000 women, defines dysmenorrhœa from the industrial standpoint as "that discomfort or pain accompanying menstruation which lessens the efficiency of women employees." Earlier records showed that 26 per cent. of the women employees needed medication, rest or advice during their menstrual period, while in this series studied during 1921 and the early months of 1922 only 6 per cent. reported to the hospital for treatment, as the policy of the medical department of this store is now to aid in every way the raising of the efficiency of the female employee during menstruation, and this is done by (1) talks on hygiene of the menstrual period are given by the physician to the sponsors, or representative women, of the store, each of whom is personally in charge of a group of women. These sponsors are chosen because it is very difficult to assemble such a large body of women employees for purposes of instruction. They are the disseminators of the store knowledge in matters pertaining to their groups of employees; hence they are made the disseminators of knowledge concerning the hygiene of the menstrual function. In

addition, with each physical examination a short personal talk applicable to the individual type of period is given, together with advice as to the proper mental attitude toward this function, its hygiene, etc. (2) A nurse is in attendance at all times and hot drinks, suitable medication, hot-water bottles, with rest in bed when necessary, are given to those who seek relief. At the end of a two hours' rest at the most, the patient is usually able to return to work. (3) The more difficult cases and the repeaters have access to the physician for consultations. (4) Medical passes are issued only in the exceptional cases. These passes are "on pay" and the attitude of the department is to do everything for the comfort of the employee, hoping to get her back on the job, rather than to issue passes by request. This attitude eliminates to a certain degree those who are compelled to remain at home one or more days of each menstrual period, and are discontinued in the turnover of labor because of their periodic absence—a survival of the fittest of those employed in this especial department store, but a sociological question of great import to the state.

The writer's conclusions are: (1) The great majority of women suffer no appreciable lowering of efficiency during the menstrual function. According to this study, 65 per cent. of the working women between the ages of 16 and 60, including those who have no menstruation owing to post-operative artificial menopause or to its natural cessation, had no menstrual handicap; 30.6 per cent. had a slight menstrual handicap; whereas only 4.4 per cent. were seriously handicapped. (2) Much can be done to overcome the lowered efficiency of women in industry by education and by the proper management of the industrial hospital. (3) The attitude of the hospital does much toward overcoming the habit of not working during the menstrual function. (4) The women employees who must remain at home every period because of severe disability should be considered in the industrial world as any other handicapped person. The question whether they should or should not be employed is a debatable one, but their disability should not be charged against the great majority of working women among whom lowered efficiency as a result of menstruation is negligible.—*Jr. Ind. Hygiene*, June, 1923.

## EPILEPSY

*Fasting and Diets in the Treatment of Epilepsy.*—In a hospital ward devoted to the care of epileptics, Weeks, Renner, Allen and Wishart (*Jr. Metabolic Research*, 1923, 3, 317) studied seventy-three of the patients with regard to the effect of fasting and of diets representing protein, carbohydrate, fat, high caloric rations and non-nutritive bulk. In most of the cases each patient went through two or three dietary studies in order that comparisons might be made in the same individual. With regard to the therapeutic value of fasting epileptic seizures ceased during the fast in only thirty out of sixty-four cases and this result is considered by the authors to be merely an accidental phenomenon capable of being brought about by a variety of other influences. Diets of non-nutritive bulk and those high in protein, carbohydrate, fat and total calories were found to be without influence upon the seizures, thus indicating the absence of a metabolic element in epilepsy.

ENCEPHALITIS, EPIDEMIC (LETHARGIC) See EPIDEMIC (LETHARGIC)  
ENCEPHALITIS

## EPIDEMIC (LETHARGIC) ENCEPHALITIS

There is perhaps no one medical question in etiology and treatment of more importance and interest to-day than that of epidemic (lethargic) encephalitis, the etiology of which is still unknown, and its allied conditions of epidemic meningitis, caused by the meningococcus, epidemic poliomyelitis, induced by a filter-passing virus or organism, and, if it be a separate entity, the Australian X disease. Prof. Lewellys F. Barker, of Baltimore, has in preparation for early publication in the INTERNATIONAL CLINICS a clinical lecture on lethargic encephalitis while Prof. J. P. Crozer Griffith, of Philadelphia, will supply our readers with a talk on poliomyelitis. Those especially interested in the subject will find the illuminating article of Simon Flexner, of the Rockefeller Institute, published in the *Journal of the American Medical Association*, November 17 and 24, 1923, of unusual importance in discussing the moot problems in these affections. In Flexner's opinion the pathological histology of X disease, with its high mortality of 70 per cent., to the extent that it shows close resemblance to frank poliomyelitis, is a distinguishing feature from epidemic encephalitis, and it is quite possible that



Australian X disease is merely an exalted form of epidemic poliomyelitis. In 1918 Pfeiffer's bacillus was generally considered as the probable microbial incitant of epidemic influenza, although there were many even then who opposed this view, and since the discovery of minute, filter-passing microorganisms, the *Bacterium pneumosintes*, as discussed in last year's article on the "Progress of Medicine for 1922," has been consistently cultured from early cases of epidemic influenza. But a single, specific incitant is probably not required in producing an epidemic of any one of these diseases, and many complex problems arise as the obvious similarities existing between the supposed virus of epidemic encephalitis and the now-accepted virus of herpes as the various strains cannot be distinguished by infection tests, by cross immunity tests, or by chemical tests. The remarks on Devil's gripe (epidemic transient diaphragmatic spasm) should also be read in this connection.

#### FLUMERIN

*A New Mercurial for the Intravenous Treatment of Syphilis.*—This new mercury preparation advocated by H. H. Young, of Baltimore, in the treatment of syphilis intravenously is the disodium salt of hydroxymercury fluorescin, and appears as a reddish powder of which one-third is mercury in the non-ionized form. For adult males the dosage is 0.2 gram to 0.45 gram administered in a 2 per cent. solution biweekly until an average of ten injections is reached. W. R. Snodgrass, of Glasgow, after treating twenty-five cases of syphilis with flumerin gives the following results:

(1) Gross secondary lesions show material alteration in the direction of healing within one week as a result of the administration of flumerin alone. No other mercurial preparation would appear to produce marked changes so rapidly.

(2) The action is not lasting. Relapses in secondary cases may occur within a relatively short time or even while treatment by flumerin is being continued.

(3) A positive Wassermann reaction is usually not altered to a negative one. In this respect flumerin does not compare unfavorably with an equivalent use of other mercurials given without salvarsan preparations.

(4) Tertiary cases which present definite lesions show rapid clinical improvement with flumerin alone. The rapidity appears much greater than that produced by other mercurials, but less than by combined treatment by mercury and iodide. No effect upon the Wassermann reaction is noted. This is not significant in view of the duration of treatment.

(5) Marked toxic effects of the nature of acute mercurialism were occasionally seen. Conversely cases of great toleration were noted. The reason for this is apparently not related to the patient's general physical condition.

(6) Extended trial of flumerin, along with salvarsan preparations or iodides, as the case demands, should be made on account of its outstanding property of rapid antisiphilitic effect.—*Lancet*, January 19, 1924.

#### FOOT-AND-MOUTH DISEASE

There is raging, but most happily on the decline at the present time, in the cattle of England an extensive outbreak of foot-and-mouth disease. Beattie and Peden (*Lancet*, February 2, 1924, 221) describe a condition of the feet, tongue, and lungs of rats and mice inoculated with material from cows which have been in contact with the foot-and-mouth disease which they consider similar to this disease itself. The advantage of having an experimental animal with which to study this affection is self-evident.

#### GONORRHOEA

*Present-day Treatment of Gonorrhœa.*—According to Major A. T. Frost (*Lancet*, November 24, 1923, 1134) the staff of the Military Hospital, Rochester-row, London, is using in the treatment of gonorrhœa, acriflavine, through the blood-stream and the cataphoretic application of colloidal silver to the urethra itself. The intravenous injection of acriflavine causes transient yellowing of the skin as there is rapid elimination of the drug in the usual doses of 0.2 to 0.3 gram, employing 100 c.c. of normal saline solution for each 0.1 gram of the gonococcicide. Hypodermic and intramuscular injections of acriflavine were, at first, not successful owing to the bulk of the injections and their acidity, which caused a local inflammatory reac-

tion. After further experiments on rabbits it was found possible to make a more concentrated neutral solution (by adding 3.5 c.c. of normal sodium bicarbonate solution to 1 g. of acriflavine and diluting to 20 c.c. with distilled water), 2 to 7 c.c. of which could be administered hypodermically without causing great pain. Three doses were given at five-day intervals. This form of treatment, which was still under trial, was found to give very encouraging results, especially in chronic gonorrhœa—one case had apparently been cured and remained free from recurrence for six months, by three injections, after having resisted other forms of treatment for the same period. The neutral solution employed must be freshly prepared every three days. Other dyes might be discovered, but acriflavine was the best as a bactericide of those which had been tried up to the present.

The production by Major S. H. Long of a pure silver colloid, stable in distilled water, provided the starting-point of an electrical method of treatment. The method first used was after the manner of ionization, employing a silver catheter filled with colloid in the urethra attached to the positive pole; this method was abandoned owing to the pain and discomfort caused by the catheter in the acutely inflamed urethra. It was then decided to try the effect of using the colloidal silver cataphoretically—that is, applying electric pressure and not electric current through a column of colloidal silver within the urethra. Electrochemically the silver colloid consisted of electronegative particles which actually moved (as could be observed under the microscope) through the medium towards the positive pole when subjected to an electrical pressure of not less than 60 volts. Cataphoresis aimed at driving these colloid particles into the urethral mucosa by electrical pressure, since the colloid was a non-conductor of electricity. The technic employed in practice consisted of cleansing the patient's urethra and bladder and then filling them with colloid silver by means of an ordinary irrigation apparatus embodying a short length of silver tubing in contact with the column of colloid. To this silver tube was attached the negative pole of a 106-volt direct current supply. The positive pole was attached to a wire gauze frame covered by washed lint moistened with saline, so shaped that when the patient sat upon it a prolongation grasped the shaft of the penis. With the voltage at zero, or "weak" on the sliding potentiometer

resistance of the switchboard, the voltage is gradually increased until a pressure of 100 volts is registered, and less than one milliampère of current. It is hoped to control current by a "wireless" valve in circuit and prevent burns by an accidental short-circuit. The current was allowed to pass thus for 45 minutes on each of four successive days, and immediately before the treatment was begun a dose of 20 million gonococcal vaccine was administered hypodermically. If, after four days, the urethra was free from discharge, the usual tests for cure were applied and the patient evacuated from hospital if he passed these satisfactorily. If discharge persisted a second dose of vaccine was given and a Kohlmann's dilator passed to open up closed follicles; after this, cure could generally be obtained by one or two further "cataphoretic" treatments. The tests of cure consisted of irrigating the urethra twice a day on two successive days with a 1 in 500 solution of magnesium chloride preceded by the injection of 100 or 200 million gonococcal vaccine and followed by the passage of a sound, urethroscopic examination, and the examination of the urine and of prostatic and vesicular secretion expressed by massage. The urine and secretions must be free from pus. As this treatment could deal only with a urethral infection, cases in which preliminary examination revealed disease in the prostate gland or vesicles received treatment with neutral acriflavine in addition to cataphoresis. Vaccines are used along with the treatment in order to increase the bodily resistance, and to open up closed follicles and thus render them more vulnerable to treatment.

Major Frost then quoted the results obtained in 107 cases. On the average these cases received nine days' electrical treatment and were in hospital thirty days, whereas the average stay in two venereal hospitals during 1922 was sixty-nine days. This method of attack upon gonorrhœa was therefore very promising, and work now in progress to discover the most effective voltage was expected further to improve the results. Other types of colloids are being investigated.

#### HÆMAL-NODES

Lederer (*Arch. Int. Med.*, March, 1923) finds hæmal-nodes to resemble the follicles of lymph-nodes, but without germinal centres or lymph sinuses. They are found most commonly in the prevertebral



fat, lying near a large blood-vessel, usually a vein, and to be well seen the fat should be cut with a knife and the whole mass exposed to the light. Pathologically, they may hypertrophy or may undergo metastatic changes. Possibly they have to do with blood formation.

#### HEART DISEASE

In the medical treatment of heart disease William H. Robey (*Boston Med. and Surg. Jr.*, 1923, 189, 91) states that digitalis and morphine are the only drugs which can be relied upon, and that they are of importance mainly when the heart has become decompensated. The commonest form of irregularity is due to premature beats. This, in the absence of cardiac or circulatory signs in young people, may generally be disregarded. Exercise is to be restricted only when other physical signs indicate its advisability. In auricular fibrillation digitalis is of great value but is often given in doses too small to be of value. Morphine and chloral hydrate are possibly the best hypnotics for acutely decompensated hearts.

*Surgical Treatment of Angina Pectoris.*—Thomas Jonnesco (*Bull. Acad. de Méd.*, October 16, 1923) advises in selected cases the resection of the cervico-thoracic portion of the sympathetic nerve as a surgical means of combatting attacks of angina pectoris. Coffey and King (*Arch. Int. Med.*, 31, 1923, 200) did sympathectomy in five carefully selected cases of angina pectoris, two of them presumably due to syphilitic aortitis. The mortality was 20 per cent. Marked improvement was noted in the four cases which survived.

*Cardiotomy and Valvulotomy for Mitral Stenosis.*—Cutler and Levine (*Boston Med. and Surg. Jr.*, June 28, 1923) have successfully operated upon a twelve-year-old girl with mitral stenosis by an elaboration of Milton's median sternotomy known as the Duval-Barasty median thoraco-abdominal-pericardiotomy. In the last stage of the operation the knife was plunged into the left ventricle at a point about one inch from the apex and away from the branches of the descended coronary artery, where two mattress sutures had already been placed. The knife was then pushed upwards about 2½ inches, until it encountered what seemed to the surgeons as being the mitral orifice. The knife was then turned mesially, and a cut made in what was thought to be the aortic leaflet of the mitral valve, the

resistance encountered being very considerable. The knife was quickly turned and a cut made in the opposite side of the opening. The knife being withdrawn, the mattress sutures were tied over the point at which the knife had been inserted. The report was made too early after the operation to determine if any good or evil results had occurred therefrom.

*Indications for, and against, the Use of Quinidin.*—Viko, Marvin and White (*Arch. Int. Med.*, March, 1923) consider that quinidin is not indicated for the treatment of heart-block, but that it is unmistakably of value in two out of every three patients suffering from non-paroxysmal auricular fibrillation, and even in paroxysmal auricular fibrillation quinidin proved of value in its prevention and treatment. Burwell and Dieuaide (*Ibidem*, April, 1923) have collected 600 case reports from medical literature treated by quinidin, and find that normal rhythm was restored in more than 50 per cent. of them.

#### HEREDITY See also CANCER

*Pawlow's Experiments on Mice Intended to Show the Possibility of the Inheritance of Acquired Characteristics.*—In 1902 the INTERNATIONAL CLINICS secured for the American medical world what is known in newspaper parlance as a "beat," on publishing the then practically unknown work of I. P. Pawlow, of Petrograd, Russia, by his assistant, Peter Borissof. According to the latest investigations of Pawlow (*Science*, November 9, 1923) the basis of nervous activity of an animal such as the dog, is formed by so-called reflexes, or, when more complex in their nature, instincts. These reflexes or instincts may be inherited, when they are called unconditioned reflexes, or acquired during life, when they are named conditioned reflexes. It took three hundred lessons by Pawlow to teach white mice to run on the sound of a bell to their feeding-place, while the second generation responded to the sound of the bell in one hundred lessons, the third generation in thirty, the fourth, in ten, the fifth, in five, and Professor Pawlow hopes to train his mice in time so that they will run to their feeding-place on first hearing the bell with no previous lessons, thus making an acquired reflex to become inherited. But in spite of innumerable generations bred in domesticity, colts must still be broken, cats still need considerable time to learn the

meaning of "Kitty, Kitty," and puppies do not even prick up their ears the first time they hear their master's whistle.

*Heredity and Sex Changes.*—A hen has her ovaries destroyed by tuberculosis, and assumes male characteristics—what fascinating subjects for study and speculation, bound up on the one hand with religion and on the other hand with the advancement or retardation of civilization itself. The old physiologies are filled with wonderful tales of how the women of beleaguered towns, in which the male deaths had been numerous, gave birth to a largely excessive number of males and of how the breast of a certain male secreted milk for the nourishment of a new-born babe who otherwise would have died for lack of nourishment. It would seem with the discoveries in wireless telephone connections, the separation of the elements into their component parts and the triple confirmation of the Einstein theory, that practically anything was possible except the creation *de novo* of life itself, but *omne animal ex ovo, omne vivens e germine, omnis cellula e cellula* and *omnis nucleus e nucleo* hold as good now as ever.

#### HERNIA

*Living Sutures in Herniotomy.*—The *Journal of the American Medical Association* of September 8, 1923, gives the interesting abstract of a paper which appeared in the July issue of the *Canadian Medical Association Journal*.

By means of experimental research extending over several years Gallie and LeMesurier have demonstrated that strips of fascia constitute a suture material which is ideal for use in operations in which it is desired to hold together structures, such as the edges of hernial rings, which naturally tend to separate. It remains only for the surgeon to employ a technic which ensures that the suture is solidly anchored into unyielding tissue, such as healthy muscles and aponeurosis, and to make sure that a sufficient quantity of the suture is employed to withstand the anticipated strain and to completely fill the gap where the edges cannot actually be drawn together. The advantages of the living sutures are: Over catgut and similar sutures they have the great advantage that they are not absorbed and that they continue for all time to perform the function for which they were originally intended. Over silk and other non-absorbable materials they have the advantage that they are composed of living tissue which is perfectly non-irritant, and that they heal solidly into the structures through which they pass without showing any tendency to cut out when subjected to ordinary physiologic strain. In operations designed to close gaps in which the edges cannot be drawn together the living sutures have the advantage over patch transplants

in that they do not depend for their success on the process of healing by scar tissue, but solely on the mechanical grip which they obtain on the edges of the ring. By weaving the sutures across the gap, as in the darning of a sock, a wall of great strength can be constructed which can be depended on to resist successfully any ordinary degree of pressure strain.

**HOOK-WORMS** See CARBON TETRACHLORIDE

**INSULIN** See also DIABETES

*Danger of Interrupting Insulin Treatment.*—L. Blum, Carlier, and H. Schwab (*Bull. et Mém. Soc. Méd. des Hôp. de Paris*, December 27, 1923, 1789) consider that patients who have received insulin treatment become more prone to acidosis, and are therefore in greater danger. Marcel Labbé has confirmed this. They describe the following cases: (1) Fatal coma in a man of thirty-five, commencing forty-eight hours after stopping insulin injections. Insulin was first given in May, 1923, and in ten days he gained 8 kilograms. He discontinued the daily injections on October 4th, and died on October 10th, in spite of the injection of 20 units, followed in five hours by another of 160 units. (2) Diabetic coma supervening after reduction of dosage; cured by large doses. A man, aged thirty, commenced treatment on June 2, 1923; phlebitis of the left femoral vein occurred, followed by the same complication in the right femoral. There was a high temperature; the patient felt very ill, and attributed this to the insulin treatment, so the dose was reduced to a quarter. Sugar and acetone increased rapidly, and in forty-eight hours he was in the first stage of diabetic coma; 380 units of insulin were given in twenty-four hours, and the next day he was much better, glycosuria having entirely disappeared. No other treatment had been given. (3) A man of thirty-one had had diabetes for eleven years; he improved greatly under insulin treatment, which was commenced in February, 1923. He required 100 units daily in order to maintain the improvement; whenever the dosage was lessened or treatment was interrupted, symptoms of intoxication occurred. The authors describe a fatal case of diabetic coma in a man of forty-two, who developed broncho-pneumonia. They comment on the surprising suddenness and severity of the coma in these cases and attribute this to the inability of the pancreas to recover functional activity. If, therefore, insulin be withdrawn carbohydrate metabolism ceases and a modification of protein and hydrocarbon metab-



olism occurs, resulting in acidosis. It would appear that the sudden deprivation of insulin determines the alarming suddenness of the onset of symptoms of intoxication; these again prevent the system adapting itself to the changed conditions. The authors find that there is no evidence that in adults, under insulin treatment, any regeneration of pancreatic tissue takes place; on the other hand, they consider that, in children, the regenerative power is much greater, and that the glandular function may be restored. In conclusion they state that in severe diabetes in the adult insulin treatment must be continuous, no matter how inconvenient this may be. The anti-diabetic dietary is always necessary.—*Brit. Med. Jr.*, February 2, 1924.

#### IVY POISONING

A satisfactory treatment for ivy poisoning seems to have been found by A. Strickler (*Jr. Amer. Med. Assoc.*, 1923, **80**, 1588). An extract of the leaves of *Rhus toxicodendron* and *R. venenata* is prepared to which he erroneously gives the name of toxin (antigen). Treatment consists in the intramuscular injection of this extract by three to five injections of 0.3 to 0.5 c.c., depending upon the severity of the attack and the response on the part of the patient. The interval between the first two doses is twenty-four hours, lengthening this to forty-eight to seventy-two hours according to the effect. Usually after about twenty-four hours following the first injection, swelling and redness begin to disappear, and generally the lesions are quite healed in four to five days even without the use of any local application. Susceptible persons may likewise be rendered refractory through the administration of four intramuscular injections given three or four days apart and varying in size from three to five c.c. Following the injections the patient is advised to take tincture of *R. toxicodendron* or of *R. venenata* by the mouth for a period of one month. The dose of each of these preparations is five to ten drops, well diluted with water, after meals.

#### LEPROSY

*Chaulmoogra oil*, one of the most ancient of the East Indian remedies for leprosy, has definite curative value in certain cases. Many of the disadvantages accompanying the use of the oil itself are eliminated through the use of the contained ethyl esters. Dean's

HI preparation, the ethyl esters of chaulmoogra oil combined with iodine, has been employed for the treatment of six cases by G. L. Hagman (*China Med. Jr.*, Shanghai, 1923, 37, 568). Twenty-three leprosy patients seen in the clinic at Nantungchow consented to undergo a year's treatment by this method. At the time of making the report only three of the six were still receiving injections. One of these had received sixty-two treatments and the leprosy bacilli were no longer to be found in nasal smears, and this is taken as one indication that the disease was arrested in this particular case. The second patient with a rapidly developing infection showed only slight improvement after twenty-four injections. The third was apparently somewhat improved after twelve injections. The other three patients, after having received fifteen, eleven and sixteen injections, respectively, no longer appeared for the injections. The one who had had sixteen showed slight improvement. The pain caused by the injection of the larger amounts was much reduced through dividing the doses and giving two intramuscular injections. As there are said to be a million lepers in China, half as many in India, and as many more scattered throughout the world, the treatment on a large scale is now being advocated in England.

**LETHARGIC ENCEPHALITIS** See EPIDEMIC (LETHARGIC) ENCEPHALITIS

#### LIVER

*Phenoltetrachlorphthalein in Estimating Liver Function.*—There is a normal bilirubinæmia as well as a hyper- and hypobilirubinæmia. Two laboratory methods are now being studied by many investigators for determining whether the liver is functioning properly or not, in each of which the dye-stuff, phenoltetrachlorphthalein, is employed: One in which the duodenal tube is used to collect the material and the other in which the intensity of the coloring matter is estimated by means of the withdrawal of venous blood from the patient undergoing the test. Piersol and Bockus (*Arch. Int. Med.*, May, 1923) present a detailed technic for estimating liver function by means of the duodenal tube and phenoltetrachlorphthalein. They consider this test to be of equal value to that of the phenolsulphonephthalein kidney function test. In a series of fifty cases they found a delay in the appearance time of the dye was

proportionate to a decrease in its output. The estimation of the output of the coloring matter in two hours appears to be of more importance than recording the appearance time itself, though records of both should be taken. In grossly pathological livers the appearance time of the maximum color was twice as long as that in normal cases (23.2 minutes as compared to 11.6 minutes) while the dye output averaged but one-eighth of the output in normal cases (2.71 mg. as contrasted with 22.4 mg.). The method has a special value in determining the functional capacity of the liver when this organ is but slightly disturbed.

**LUMBAR DRAINAGE** See also CISTERNA MAGNA

*Continuous Lumbar Drainage.*—The lumbar puncture is made in the usual manner and place, and after the withdrawal of the needle loops of silver wire are introduced into the canula, and the canula then removed. The flow is regulated by elevating the foot or the head of the bed, and by supporting the hips or raising the shoulders by pillows, and this form of drainage may be kept up with benefit in suitable cases for a week or ten days. Should serum medication be indicated, this can be introduced at a slightly higher level.—Schnuren in *Nederlnd. Tijdschrift. v. Geneekunde*, Dec., 1922.

**MEASLES**

*Etiology of Measles.*—Several observers have obtained from patients with measles a diplococcus whose constant presence in the disease seemed to be suggestive of an etiological relationship. Whether or not it is the same organism that has been the subject of special study by Caronia (*Pediatrics*, 1923, 31, 801) it is impossible to say. He has nevertheless isolated a diplococcus which he considers to be responsible for the disease. This coccus in the cycle of its development passes through an ultramicroscopic phase. It appears as a small diplococcus only when cultivated under special anaërobic conditions and on a special medium. Caronia has obtained cultures of this diplococcus not only from the blood and nasopharyngeal secretions of children in the prodromal and eruptive stage of measles but also from the bone-marrow and cerebrospinal fluid. The blood of patients shows the presence of antibodies specific for this microörganism.

It is claimed that young rabbits inoculated intravenously with large amounts of blood from measles patients developed a clinical picture resembling human measles and the same diplococcus was recovered from their blood. Healthy children injected with inactivated or attenuated cultures developed immunity to measles. Three healthy children inoculated with large and repeated doses of recent cultures developed a typical but attenuated form of measles, the eruption being brief but universal and accompanied by high fever. In these patients the serological reactions were positive and the microorganisms could be cultivated from the blood and from the filtrates of secretions from the nose and throat. (*Lancet*, 1923, 2, 772-773.)

#### MEDICAL EDUCATION

It is always interesting to know what someone else thinks of American educational methods—even if he holds what we must consider a wrong opinion of conditions as they exist in this country. Sir Wilmot P. Herringham, K.C.M.G., M.D., consulting physician to St. Bartholomew's Hospital, London, writes as follows in the *British Medical Journal* of September 29, 1923:

"There is, however, now current, especially in America, what may be called the encyclopædic theory. Not the formation of judgment but its suspense is the function held most high. British teachers are criticized for training with a view to diagnosis instead of insisting on observation alone. Diagnosis itself is made a secondary thing, an object possibly of distant hope, like a future life, but not a thing to guide our action in the present. The first thing necessary is to make such a complete and detailed study of the patient's state that no cell remains unturned. That the world shall not contain the books (of notes) that shall be written is perhaps of little moment in a country that measures 1500 by 3000 miles; that before an exhaustive study such as this is finished both teacher and student may have sunk into the grave is not an obstacle in a population of a hundred millions, nor where it rains dollars need the cost be prohibitive. But it seems doubtful if in some cases the patient's untimely death may not render nugatory the incomplete though magnificent attempt.

"Seriously, however, it is to be hoped that the British point of view may be maintained. On nothing has so much nonsense been talked as on the subject of education, and on nothing are sensible men more prone to push their views to an excess which is ridiculous. Just at present the immense increase of our powers of observation has naturally led men to exaggerate its scope. We have indeed seen instances in which new light has been shed by phenomena which are usually insignificant, but that is not to say that such occurrences are common. It still remains true that in the great majority of cases we know the limits within



which laborious observation may be usefully employed. And while it is in thorough accord with our traditions to ply observation to its fullest limit, yet it is our habit to try to make up our minds."

#### MENSTRUATION

*Early Menstruation.*—Thom and Hershman (*Amer. Jr. Obstet. and Gyn.*, September, 1923) describe in an illustrated paper the history of a four-year-old Russian Jewess who started menstruation at forty-two months, and showed well-developed anatomical sexual characteristics without psychic symptoms of precocity, and no changes in the sella turcica as demonstrated by the X-rays.

#### NEURALGIA

*Dangers of Alcohol Injections in Neuralgia.*—The therapeutic value of injecting alcohol into the gasserian ganglion and into the trunks of nerves, is now well recognized, but sufficient attention has not been called to the dangers of injuring other adjacent nervous tissue by the injection rather than the one for which the alcohol was intended. Blindness and loss of hearing have been of not infrequent occurrence by this means, but the danger of reporting these cases with the consequent legal consequences which might follow have prevented a number of surgeons who have had mishaps to put their bad results on record. During the past year in England under sealed doors there have been several confessional meetings in which surgeons have frankly confessed their failures. We recall well, in the days where the uterus and its adnexa were removed on the slightest pretext, of having to make postmortems on three cases within a year where death had been caused by the tying of a ureter during the operation. One of the surgeons was honest and brave enough to report his untoward results, but the other two surgeons, though present at the meeting in which the paper was read, kept silent as to the history of their own cases in which the ureter had been tied and death ensued therefrom.

#### NURSES

*Shortage of Nurses.*—The Rockefeller inquiry into the proper training of public health nurses has started a discussion as to the kind of nurse most needed to take care of the sick and of teaching hygienic measures to the well. Money never will purchase certain

of the best attributes in a nurse, while overtraining frequently spoils a well-meaning and useful member of this necessary vocation. The time of graduate nurses is too frequently, 25 per cent., taken up by work that could be done equally well, and often much more acceptably, by an attendant but the name of "attendant" to this subsidiary group is objectionable while that of "practical nurse" is considered by the R. N. S. as derogatory to their existing professional status, for which they have been striving ever since the days of Florence Nightingale. Nursing attendant would seem a proper designation.

A middle-class patient tells us the kind of nurse she wants in the *Lancet*, December 1, 1923.

"I have just recovered from a troublesome prolonged but not very dangerous illness in which I badly wanted someone to wash me, to bring me my food, to make my bed, and in fact to attend to my physical needs. My doctor wished me to engage a trained nurse, a demand with which I should have been only too happy to comply if it had been possible to provide the extra accommodation, household service, and the meals more elaborate than the usual family ones. I could not face the prospect of having a guest who was entitled to a higher standard of comfort than that of my very modest household. The situation is a familiar one for which I can see no solution. Maybe there is no solution."

And let us also not forget that many males when ill prefer a good male nurse to look after their physical needs and to attend properly to the physician's directions.

#### OPHTHALMOLOGY

That the International Labor Office of the League of Nations, at Geneva, Switzerland, is functioning, is shown by the issuance of the valuable booklet of 160 pages on "Problems of Industrial Illumination," with an extensive bibliography. The table of contents includes such subjects as: The comparison of various sources of natural and artificial light, the minimum amount of light required for various employments, and the methods whereby it can be measured; ocular fatigue and its prophylaxis in different employments, its bearing on progressive myopia and on miners' nystagmus; industrial accidents due to deficient illumination; and a comparison of the regulations in force in different countries whose object is the minimizing of ocular fatigue in industrial employment.

*Gulstrand's Slit-lamp in Ophthalmology.*—The slit-lamp and binocular corneal microscope devised several years ago by Gulstrand,

of Sweden, is one of the most important instruments of precision introduced practically into scientific medicine during the year 1923. The beautiful illustrations which accompany the paper of Arthur J. Bedell (*Jr. Amer. Med. Asso.*, February 2, 1924) show what can be done as never before in studying the lens of the eye. By this new and valuable instrument in the hands of an expert, the different constituents of the capsule and lens will be better discernible and the physiology and pathology of the lens will receive a new impetus for study, not obtainable by any other method now known.

The *Lancet* of January 26, 1924, describes this instrument and how it is being used as follows:

The apparatus consists of a strong light focused on any desired part of the eye by a system of lenses through an adjustable slit, producing a prism-shaped area of illumination which, viewed with a binocular magnifier of about 24 diameters by the dark-adapted eyes of an observer, displays such objects as the nerve fibres in the cornea or the blood-corpuscles circulating in the corneal vessels. The apparatus is somewhat expensive; its routine employment in the consulting-room would materially add to the time necessary for examining a patient, and to acquire facility in its use requires about as much practice as that necessary to become at home with the use of the ophthalmoscope. Nevertheless, its importance as an aid to scientific diagnosis is great, and it is believed by some that its introduction will mark a new era in ophthalmology, comparable to that opened by the invention of the ophthalmoscope itself. In the December number of the *British Journal of Ophthalmology*, Mr. Harrison Butler gives an account of a special week's course on the subject, held at the University Eye Clinic at Zurich by Prof. Alfred Vogt, who has also published an atlas of slit-lamp microscopy. It can hardly be expected that the practical clinical discoveries from the new method can be very striking as yet, but Vogt claims that the earliest clinical sign of sympathetic ophthalmia is the appearance of clusters of cells in the aqueous which can only be seen by this method. Perhaps the most promising field of discovery is the lens, a complete section of which can be illuminated by this method, displaying the exact localization of opacities. For examining the fundus of the eye the slit-lamp is only available when combined with a contact lens which abolishes the refraction of the cornea, a method which has been worked out by the German ophthalmologist, Koeppel, who employs a linear magnification of 80, but which is not practicable at present for every-day clinical work.

#### PELLAGRA

Two fatal cases, both in women, one forty-five and the other thirty-six years of age, are reported by G. H. Stevenson (*Canad. Med. Assoc. Jr.*, Montreal, 1923, 13, 504). Both patients exhibited the three cardinal symptoms—dermatitis, diarrhoea and delirium.

*Solution of the Pellagra Problem Near.*—That we are definitely approaching the complete solution of the pellagra problem seems clearly indicated by the recent report of Goldberger and Tanner (*Pub. Health Rep.*, 1924, 39, 87), which gives lucid details of experiments showing the value of fresh meat and of milk, the therapeutic failure of gelatin, and the preventive failure of butter and of cod-liver oil.

In 1914, Goldberger, Waring and Willets made some studies which resulted in demonstrating the complete preventability of pellagra by means of diet. In this first test the indications were not entirely clear as to the identity of the foods concerned in preventing the disease but the hypothesis that a dietary insufficiency was responsible for pellagra received support from studies made in certain mill villages of South Carolina. Pellagra occurred less frequently or not at all in households where the daily consumption of milk or meat was approximately one pound or 30 grams, respectively. Furthermore, it was found that an increasing supply of each of these foods independently was definitely associated with a decreasing pellagra incidence. The studies just reported bring further evidence of the value of fresh meat in the treatment of the disease and of buttermilk in its prevention. At the Georgia State Sanatorium eight well-marked, but not very severe, cases received 7 oz. (200 gm.) of fresh lean round steak in addition to the diet of which they had been partaking at the time their pellagra developed. In all eight cases there was well-marked and progressive clinical improvement. In four of these cases there had been a preliminary period of treatment with gelatin which, though combined with a mineral and vitamin enriched basic diet, had failed to arrest the progress of the attack.

Milk was tried preventively as buttermilk giving a daily allowance of approximately 1200 gm. (40 fluid oz.). Of the twenty-nine patients given milk, nineteen were pellagrins and ten were non-pellagrins. The result constitutes a direct demonstration of what heretofore had been an inference from indirect evidence; that is "that milk contains the essential pellagra preventive factor or factors."

It is pointed out that we are still ignorant of the exact identity of the active substances themselves and there is a possibility that other foods than meat and milk may contain such substances, possibly in greater concentration.



The authors have demonstrated, furthermore, that fresh butter and cod-liver oil, at least in the quantities used, failed to prevent pellagra in the several instances in which they were tried. It is concluded by Goldberger and Tanner that "the primary etiological dietary factor in pellagra is a faulty protein (amino-acid) mixture, and a deficiency in some as yet unrecognized dietary complex (possibly a vitamin), or some combination of these."

#### PERNICIOUS ANÆMIA

Observations made upon albino rats having led to the conclusion that the administration of germanium dioxide brings about a rise in the number of their red blood-corpuscles, led M. E. Alexander (*Am. Jr. Med. Sc.*, 1923, 166, 256) to test its value in the treatment of pernicious anæmia. Three patients were selected, one a far-advanced case, the others moderately advanced. Despite careful treatment no clinical improvement was noticed in any of the cases. There was no increase in the hemoglobin or in the number of erythrocytes during the period of observation.

**PHENOLTETRACHLORPHTHALEIN** See LIVER

**PHLEBOTOMUS PAPATASII** See SAND-FLY FEVER

#### POLIOMYELITIS

*Convalescent Serum.*—The use of convalescent human serum injected intraspinally and intravenously together with hypertonic salt solution injected intravenously resulted, in the experiments of Aycock and Amoss (*Jr. Amer. Med. Assoc.*, 1923, 81, 474) in marked improvement in the case of poliomyelitic monkeys. The intravenous injection of hypertonic salt solution results in the shrinking of the central nervous tissue, thus leaving more room in the sub-arachnoid space for large doses of serum. The special advantage in this lies in the fact that larger doses are necessary since the antibody content of convalescent serum is so low. Another advantage is that the intravenous injection of hypertonic salt solution results in the aspiration of serum from the subarachnoid space into the perivascular system, thus resulting in more intimate contact between the most important lesions of poliomyelitis and the serum. This method has been used by the authors in one case of acute poliomyelitis of the

Landry type. The patient, whose age was four years, upon discharge from the hospital was much improved. The authors promise a more complete report of their work in the future.

#### POSTMORTEMS

It seems a pity that professional standing is not more often estimated upon the basis of a physician's interest in having the accuracy of his diagnosis for the death certificate investigated by a post-mortem examination in every fatal case. In private practice there may be insurmountable difficulties for the making of a necropsy; but in our hospitals where every facility exists for performing a thorough examination of the dead body without the slightest offence to the sensibilities of relatives and friends, too often lack of interest or laziness, and not lack of time, is the true explanation for the low percentage of autopsies undertaken.

The problem of raising the percentages of postmortems obtained at the Philadelphia General Hospital has been attacked systematically by E. B. Krumbhaar (*Jr. Amer. Med. Assoc.*, 1923, 80, 1682). At that hospital the interns receive special training concerning the methods for approaching the relatives of the deceased in a tactful and sympathetic manner with regard to obtaining permission for a post-mortem examination. The interest of the interns is stimulated by posting a monthly tabulated record showing the number of autopsy permissions secured by each resident physician. The results of these examinations are presented at weekly clinical pathological conferences. In Pennsylvania a physician has the legal right to have performed such post-mortem examination of the body as may be necessary to determine an otherwise unknown cause of death. A most important point in increasing the percentage of necropsy permissions is coöperation with local undertakers. Krumbhaar has secured such coöperation by inviting to the hospital necropsy-room students of the local embalming school so that they may see how carefully and respectfully autopsies are performed; by giving occasional talks at undertakers' meetings; by cautioning the morgue attendants and physicians against giving the undertaker any undue trouble through the performance of the autopsy and by advancing the time of the necropsy when requested to do so to suit the family or undertaker and by delivering the body at the hour agreed upon.

It may not be uninteresting in this connection to put on record the fact that when Dr. Henry F. Formad was pathologist to this institution he complained to such good effect to the Board of Managers that a resolution was passed by the Board requesting Dr. William Osler, then visiting physician to the Hospital, to cease performing autopsies in the dead-house!

#### PSORIASIS

*Psoriasis Treated with Injections of Milk.*—Nothing has been more clearly demonstrated in the past year than the fact that protein shock has enormous therapeutic value. The difficulty lies in our inability to elicit exactly the proper degree of reaction or to find a substance which will usually stimulate a beneficial reaction and still possess no tendency to do harm. Among the most popular of the agents in use at the present time is milk, even with its potential bacteriologic contra-indications.

There have been numerous reports in the literature of the successful treatment of the disease by injections of milk. J. Fex gives the details of his "Treatment of Psoriasis with Injections of Milk" in *Acta dermato-ven.* (Helsingfors, 1922, 3, 422). Since 1918 there have been treated 105 cases of psoriasis at the St. Göran Hospital in Sweden and sixty of these cases were given local treatment only; thirty-one of these were discharged as cured or nearly cured, and twenty-nine as improved. The other forty-five patients received intramuscular injections of sterile milk before local treatment was started. The dosage was 2 to 10 c.c. every third day, five injections being the rule. It is stated that the milk was sterilized by boiling for at least ten minutes. Evidently knowledge of the resistance of the spores of *B. botulinus* and its possible distribution have made less impression in Sweden than they have in this country. It is well known here that boiling botulinus spores even for several days will not destroy them and that many of the spores of the tetanus bacillus will withstand the temperature of boiling.

Fex believed that the injections of milk, which were followed by the usual local treatment, hastened the reaction of the disease to the local treatment, yet it is noted that the condition is apt to relapse as soon after this treatment as after local treatment alone.

## PSYCHOSES

*The Stomach as a Focus of Infection in the Functional Psychoses.*—The contention of Cotton (*N. Y. Med. Jr.*, 1920, 111, 672, 721, 770) that certain functional psychoses are due to focal gastric infection has been subjected to critical study by Kopeloff (*Am. Jr. Med. Sci.*, 1923, 165, 120–129). Using the Rehfuß method of fractional gastric analysis Cotton came to the conclusion that “the stomach and duodenum are very frequently the seat of secondary foci \* \* \* the bacteria invade the stomach wall and appear to interfere with the secretion of hydrochloric acid, so necessary to digestion. Cultures of the stomach contents will reveal the presence of various types of streptococci and frequently of various types of colon bacilli. The chemical examination of the stomach contents will show either a very low secretion of hydrochloric acid, or, in many cases, its entire absence during the test meal.”

Attention is called by Kopeloff to the fact that these conclusions are based upon single determinations by the Rehfuß method of fractional analysis, whereas repeated analyses carried out on the same individual within a short period of time yield different acidity curves. The same subject may show a low, high and intermediate acidity on three separate analyses carried out within a single week. Studies of the bacterial content in fractional gastric analysis carried out repeatedly on normal persons and psychotic patients have shown correlation between high acidity and low bacterial count in only half the instances. There must be some factor operating, therefore, other than the relative acidity of the gastric contents to determine a high or low bacterial count. Close study of this problem made it evident that the amount of saliva swallowed by a patient during the two and one-half hour period necessary for a complete gastric analysis by the fractional method was of considerable significance. Controlled studies were therefore made upon a number of patients and upon normal individuals, first, without any attempt to influence the amount of saliva swallowed, that is, using the ordinary Rehfuß technic; then the procedure was repeated but taking great pains to reduce to a minimum, first, the contamination of the saliva itself, and second, the amount of saliva actually swallowed. To control the swallowing of saliva a dental suction tube was placed in the



mouth and kept there for some time previous to the introduction of the Rehfuß tube, and throughout the time of observation. In one case, the number of bacteria found in the stomach when the saliva was excluded was only 0.007 per cent. of the number found when the usual technic was followed. Careful repetition of such studies has made it quite clear that the chief source of bacteria in the stomach when analyses are made by the Rehfuß method is the saliva. "Cotton's contention that the stomach is a focus of infection finds no substantiation after a critical inspection of the fundamental facts \* \* \* \* consequently no validity can be attached to the conclusion based upon the use of this method that the stomach bears an etiological relationship to the development of a stomach disease or a psychosis."

The question is not raised in this work as to whether or not there may be foci of infection in the stomach where organic lesions are present, for undoubtedly ulcers and other similar conditions may well act as foci of infection. "The chief concern is whether the stomach is a focus of infection where there is no indication of organic lesions, or where no other criteria than the Rehfuß method for establishing such infection has been used as in cases reported by Cotton, which have yielded to treatment with autogenous vaccines."

#### QUINIDIN

*Clinical Studies of Quinidin.*—At the Cook County Hospital in Chicago Carr and Spooneman (*Jr. Amer. Med. Assoc.*, 1923, **81**, 287) have studied the treatment of auricular fibrillation with quinidin sulphate in sixty-one cases, the patients ranging in age from twenty-five to seventy-nine years. The heart disease was of the rheumatic type in thirty-three cases and of the arteriosclerotic type in sixteen. Various etiologic types were represented by the others. In the selection of patients those with manifest heart failure were not given quinidin; neither did those receive it whose symptoms justified the probable diagnosis of former emboli, when mental symptoms accompanied the arteriosclerosis, and when the cardiac condition was an incidental complication of some other disease. The patients were confined to bed during treatment and three grains were given every four hours to test their susceptibility; if no unfavorable symptoms

developed 5 or 6-grain doses were given three or four times a day. Of the cases treated, seventeen, or 28.3 per cent., resumed sinus rhythm. These poor results are explained by the fact that practically all the patients were "old cardiacs," and such results are quite in harmony with the idea that quinidin is more likely to cause resumption of normal rhythm in those cases in which fibrillation is of recent onset. The most striking feature in the successful use of quinidin was, in the experience of Carr and Spoeneman, the subjective relief experienced by the patients to whom the drug was administered.

**RABBIT FEVER** See TULARÆMIA

**RÖNTGEN-RAYS** See also X-RAYS

*Röntgen-ray vs. Vaccines in Treatment of Acne.*—In the opinion of Howard Fox (*Jr. Amer. Med. Assoc.*, 1923, 81, 1417) the treatment of acne with the röntgen-rays is far superior to that of vaccines. The personal experience of the writer covers the treatment of acne by the röntgen-rays in 191 cases, of which the eruption entirely disappeared in 111; practically disappeared in forty-seven; and there was much improvement in twenty-seven; while marked relapses occurred in four patients; and the treatment was a complete failure in but two instances.

**SAND-FLY FEVER**

*Etiology of Phlebotomus Fever.*—Sand-fly fever is caused by the bite of the *Phlebotomus papatasi* infected in its breeding grounds. Prophylactic measures must be directed upon the fly, and in order to do this Whittingham and Rook (*Brit. Med. Jr.*, Dec. 15, 1923) have given us a sound working knowledge of the life-history and bionomics in a most interesting illustrated paper so that these measures may be applied successfully and economically in stamping out the disease where it exists as in Malta.

**SCARLET FEVER**

*Etiology of Scarlet Fever.*—In spite of the continued efforts that have been made over a period of many years to learn the identity of the agents which cause the acute exanthemata there is but little to record in the way of success.

At the present time attention is being devoted to those technical procedures which have for their purpose the demonstration of ultra-microscopic viruses. The theory that some such influence attacks the endothelial cells facilitating infection by secondary factors is attractive. This would account for the constant finding of streptococci in association with scarlet fever, the streptococci themselves being unable to initiate the disease while responsible for practically all of its clinical manifestations. There may, indeed, be a special type of the streptococcus responsible for scarlet fever secondarily in this manner, if not indeed primarily and directly. It will be remembered that Gordon (*Brit. Med. Jr.*, 1921, 1, 632), through the application of the agglutinin absorption technic, found three distinct types of hæmolytic streptococci and that one of them—his Type III—was found chiefly in the tonsils and fauces of scarlet fever patients. Bliss (*Johns Hopkins Hosp. Bull.*, 1920, 31, 173; *Jr. Exper. Med.*, 1922, 36, 575) had already reported finding hæmolytic streptococci in 100 per cent. of the throats of scarlatina patients examined in the first week of the disease. He found, furthermore, that many serums prepared through the injection of the scarlatinal streptococci agglutinated more than 80 per cent. of strains isolated from scarlatinal throats.

Tunnicliff had also made observations of a serological nature which indicated to her that the streptococci from scarlatinal throats are apparently peculiar to this disease. She came to this conclusion through studies using agglutination tests and the opsonic technic.

Caronia and Sindoni (*Pediatrics*, 1923, 31, 745) believe their observations justify the claim that the streptococcus with which they have been working bears a causative relation to scarlet fever. They have passively immunized rabbits by the injection of serum from convalescent children and they claim to have actively immunized children by vaccinating them with killed cultures of their streptococcus. Upon exposure the injected children failed to contract the disease. Five children convalescent from measles were inoculated with cultures and all of these children developed what was believed to be an attenuated form of scarlet fever. Serologic tests with these children gave positive results and they did not contract

scarlet fever after being in contact with other patients suffering with the disease.

Active immunity to scarlet fever has apparently been obtained by Takahashi, of Tokyo (*Japan Med. World.*, Tokyo, 1921, 1, No. 2, 1-4). He injected five of his own children, whose ages ranged from three to ten years, subcutaneously with 0.0001 c.c. of the blood of a scarlet fever patient. No local or general reaction followed. To prove that active immunity was actually produced 0.15 c.c. of the blood of a scarlatinal patient was injected into each child fifty days after the inoculation; furthermore, their throats were smeared with material taken from the throat and blood of the patient fifteen days after the inoculation. These tests failed to induce any symptoms of scarlet fever.

Interesting studies upon scarlet fever have recently been made by George and Gladys Dick (*Jr. Amer. Med. Assoc.*, 1923, 81, 1166). A nurse who was taking care of a patient with scarlet fever came down with a mild but typical attack of the disease herself. She had noticed two days before the onset of symptoms that she had a sore finger and on the second day of the disease, when the rash was intense, a few drops of pus were obtained from the lesion on the finger. The cultures made from this pus revealed the presence of a hæmolytic streptococcus and a diphtheroid bacillus. With the streptococcus after its isolation in pure culture, five volunteers were inoculated by swabbing the tonsils and pharynx. For this purpose four-day-old cultures of the streptococcus grown on sheep's-blood agar were used. In three of the volunteers the results were entirely negative but in one of the others the inoculation was followed by a sore throat and fever without a rash, and the fifth developed a mild typical attack of scarlet fever.

In order to investigate the possibility that an ultramicroscopic virus was also concerned in initiating the disease, sterile filtrates from the hæmolytic streptococcus culture were inoculated into five volunteers with entirely negative results. On the eleventh day following the inoculation with the filtrate four of these volunteers were inoculated as the first five had been; that is, with the four-day culture of the hæmolytic streptococcus unfiltered. After this second inoculation, two of the volunteers remained entirely well, in one



a sore throat developed accompanied by fever but without rash, and one developed a sore throat but neither a fever nor rash. The fifth volunteer of this series on the thirteenth day after inoculation with the filtrate was inoculated with an unfiltered culture of the hæmolytic streptococcus; forty-eight hours later typical scarlet fever developed.

These authors caution against the drawing of sweeping deductions from their observations; as links in the chain of evidence connecting the streptococcus etiologically with scarlet fever, however, their work is so suggestive and was so carefully controlled that the final explanation must, it would seem, take their results into consideration.

The Dicks, of Chicago, consider that the *Streptococcus* which they have been using in their experiments for studying the etiology of scarlet fever fulfills all the requirements of Koch's laws, the more especially as they have now perfected a skin-test which bears a specific relation to immunity in scarlet fever.—*Jr. Amer. Med. Asso.*, January 26, 1924.

#### SEASICKNESS

*Atropine in the Treatment of Seasickness.*—Stephani (*Il Policlino*, Nov. 19, 1923, p. 1530) considers seasickness to be due to hyperæmia of the labyrinth, consequent on excitation of the pneumogastric nerve. Atropine, in milligram doses, not exceeding four, was found to be most useful in warding off seasickness.

#### SEX

Telegraphic reports from abroad announce that the determination of the sex *in utero* may be prognosticated with considerable certainty from a study of the maternal blood even as much as four months before birth; but these reports do not state what takes place when there are twins present of the opposite sex.

**SEX CHANGES** See under HEREDITY

#### SHEPPARD-TOWNER MATERNITY LAW

According to the *Boston Med. and Surg. Jr.* of June 28, 1923, Doctor Carothers, President of the Ohio State Medical Association, sarcastically opposes the Sheppard-Towner maternity law, while the

State of Massachusetts itself was thrown out of the Supreme Court in a case to test the validity of the law because at the time of bringing the suit the State could show no damages. "As the Federal and State Governments propose going into the profession of midwifery," we suppose that they will next propose to start foundling asylums upon similar lines.

#### **SMALLPOX**

*The Laboratory Diagnosis of Smallpox.*—The Paul method makes possible the certain diagnosis of smallpox in about forty-eight hours. The technic is so simple and the results apparently so clear and dependable, it is surprising that this method while in common use in Europe is not better known here. After a thorough investigation J. M. Scott and C. E. Simon (*Am. Jr. Hyg.*, 1923, 3, 401-415) have concluded that "the so-called Paul reaction when controlled by histological examination constitutes a most valuable method for the diagnosis of smallpox."

Material is taken from lesions during the vesicular or pustular stage of the disease and placed on clean microscope slides, the lesions having first been cleansed with alcohol and sterile cotton and opened with a sterile needle or scalpel. The slides containing the material are allowed to dry in the air and are packed in such a way as to protect the specimen in transit. Later in the disease when crusts only are available the round, brown scabs with smooth surface should be selected, lifted out and placed in sterile vials. At the laboratory the specimen is used to inoculate the cornea of a rabbit. To make a properly controlled test both eyes of the animal are cocainized and scarified with a fine dissecting needle, using the cross-hatch method. A thick emulsion of the material with normal salt solution is then placed upon one of the eyes, the other serving as a control. The authors used for this purpose a platinum loop, rubbing the emulsion gently into the scarifications. Irrespective of any visible lesions on direct examination, the animals should be killed at the end of forty-eight hours and the eyes removed. On naked eye examination the cornea inoculated with variolous material seems dotted with tiny air bubbles which cannot be wiped away. A hand lens reveals bleb-like elevations with crater-like depressions.

While such an examination in most cases may fix the diagnosis, the result is more satisfactory if the enucleated eyeballs are examined in sublimate alcohol. The sublimate bath is composed of two volumes of saturated solution of mercuric chloride (4 grams  $\text{HgCl}_2$ , 60 c.c. water, dissolve with heat; cool and filter) and one volume of 96 per cent. alcohol. After two to four minutes the eyeballs are removed to 70 per cent. alcohol where they may remain until there is time to examine them.

In the sublimate bath the normal control eye becomes evenly opaque, with the exception of faint lines which represent the original scarifications. The variola infected cornea shows a background, milk-white in appearance, and in addition within the scarified area there are scattered, intensely white, and opaque elevations, some of which present a distinctly visible crater in the centre of the elevation. "This picture is pathognomonic of variola infection. It is never seen after inoculation of varicellar material and is very different from the picture presented by a purulent process." It is considered advisable to confirm the diagnosis by histological examination of the corneal lesions.

Since active vaccine virus, provided it is not too fresh and concentrated, produces the lesions described above, those intending to apply the Paul test may gain whatever experience is necessary without difficulty. The authors checked up their results with a great variety of known variolous material and with specimens from several other cutaneous lesions including varicella and herpes and pure cultures of the more common pyogenic bacteria.

It is the opinion of many public health authorities that there are at least two strains or types of variola virus active in this country at the present time. One of these is of low virulence and produces an infection in which the mortality rarely goes beyond 5 per cent. This virus is similar to, if not identical with, that of the so-called Kaffir pox or alastrim reported frequently as occurring in tropical countries, especially in Jamaica. The other virus is high in virulence and is the one responsible for such epidemics as have occurred in Kansas City and Denver where the death-rate has been above 30 per cent. Diagnosis in the case of the latter would probably offer little difficulty, but infections caused by the mild type of virus nearly

always result in a certain amount of controversy as to whether the disease actually is smallpox—or alastrim—or whether it is chickenpox. Through the use of the Paul method it seems entirely possible to settle such discussions with certainty and with little delay.

#### SOUTH AMERICAN PROGRESS OF MEDICINE

During the latter part of 1923 *La Presse Médicale* published an interesting series of papers by H. Roger upon his recent visit to South America, and the articles are a revelation of the medical progress that is taking place in that portion of the world. The ordinary ignorance of matters pertaining to the various countries of South America is deplorable, and is only equalled by the lack of knowledge of American institutions by the German-speaking physicians during the seventies and eighties of the last century when so many Americans were studying abroad. That the seat of medical learning is now in America, few will deny: That it should pass from the North Continent to the South Continent, many here would deplore. The recent visit of the party of surgeons composed of members of the American College of Surgeons (*Boston Med. and Surg. Jr.*, May 31, 1923; *Wisconsin Med. Jr.*, June, 1923) was admirable, and we well recall what a good start the Pan-American Medical Congresses made which William Pepper did so much to promote, and one of which was held in Washington during Cleveland's second administration. William Powell Wilson, the far-seeing Director of the Commercial Museum of Philadelphia, states that there are penal institutions in Brazil which surpass anything in America, both in the buildings themselves and in the handling of the prisoners. We shall take space to mention but a few of the many splendid medical institutions in South America: The substantial medical buildings of the Faculty of Medicine at Rio de Janeiro and at Buenos Aires, and the Institute Oswaldo Cruz, of Rio. The medico-legal institute at Santiago, Chile, planned after the one of a like nature in Paris, has just been completed, and a maternity unit with one hundred and eighty beds is being constructed, the Hospital Vincent-de-Paul which is used by the medical school having seven hundred beds. Here is also a well-equipped dental school with a four-year course of study, founded in honor of Valenzuela Basterrica, who unearthed by the



study of the teeth of a burnt body the crime of a German chancellor. The profusely illustrated paper by Zorraquin which appeared in French and Spanish, as well as in our own quarterly last year, well shows the excellent character of work now being done.

#### SPRUE

*Treatment of Sprue Based on a New Theory.*—A theory as to the causation of sprue is promulgated by H. H. Scott (*China Med. Jr.*, Shanghai, 1923, 37, 581), who believes that an acid dyspepsia is the primary factor in producing sprue in endemic areas, as from the excessive use of citrates causing calcium deficiency, or where there is an excessive protein or fatty diet. The author has observed a remarkable similarity between many of the symptoms of sprue and those occurring in other diseases in which there is calcium deficiency or disordered calcium regulation in which the parathyroid glands play a part; for example, tetany, loss of weight, cramps and at times œdema. Basing his treatment upon this idea Scott administered calcium in a case of sprue of nearly two years' duration, with only temporary benefit; but when the calcium was administered in combination with parathyroid, the beneficial results were most striking.

#### SUNLIGHT

*Dermatitis from Sunlight.*—A remarkably violent dermatitis after slight exposure to sunlight is noted by Fredrik Grön (*Acta dermato-ven.*, Helsingfors, 1923, 4, 53). A man, aged forty-nine, whose skin had always been sensitive to sunlight, bathed in the sea on two successive days. The second time he was exposed to bright sunlight for only about five minutes. Three hours later he experienced severe itching of his neck and back, a condition which increased rapidly in severity. Upon examination it was found that his whole trunk was scarlet red, the sides of the body being œdematous. The itching was so severe his sleep was much disturbed for two nights but on the following day the condition had almost completely passed off and was followed by no desquamation or pigmentation. The remarkable points in this case are the exceedingly short exposure considering the severity of the case, the violent itching and the disappearance of the erythema without leaving even a trace of pigmentation and without desquamation.

**SYPHILIS** See also FLUMERIN

*Trépol and Neotrépol in Treatment of Syphilis.*—Trépol is the basic tartro-bismuthate of potassium and sodium, while neotrépol is metallic bismuth in suspension in a sterile isotonic solution. Levaditi, Fournier, and other French physicians are using these new preparations in the place of mercury and arsenophenamin with alleged good results. It would appear that the importance of this medicament would demand an original contribution upon this subject in the pages of the INTERNATIONAL CLINICS during the coming year.—*Presse Médicale*, July 26, 1922, and *Lancet*, March 31, 1923.

**TRYPAÑOSOMIASIS**

*Bayer 205.*—The preparation known as "Bayer 205," reviewed in detail in the article of the "Progress of Medicine for 1922" (INTERNATIONAL CLINICS, Series 33, volume 1) has definite value in the treatment of African sleeping sickness, both in man and in animals. Efforts are being made in Germany to improve upon the present preparation, but no announcement has yet been given upon the therapeutic results obtained. P. K. Kleine and W. Fischer (*Deutsche med. Wchschr.*, 1923, 49, 1039) state that their results in Rhodesian sleeping sickness have been very good. Out of thirty cases treated only  $6\frac{2}{3}$  per cent. ended fatally, while all the others showed blood free from trypanosomes. Germany is hoping by the giving of this remedy to the world to have her colonies restored to her which she lost in the Great War.

**TUBERCULOSIS**

*Specific Treatment of Tuberculosis.*—Despite repeated failure and with but scant hope of success from a theoretical standpoint attempts continue to produce specific biological agents for the prevention and treatment of tuberculosis. It seems there must always be a few misguided individuals, some of them undoubtedly honest, whose claims and methods suggest so strongly an underlying basis of exploitation for commercial purposes or personal aggrandizement that serious discussion can scarcely be accorded their rather tiresome procedures.

There may be a possibility that in carefully selected cases Old Tuberculin, when administered with the greatest care and under

optimum conditions, stimulates the production of fibrous tissue about the foci of infection and thus hastens and possibly prolongs the arrest of the infection. If any remedy is able to accomplish this result, Old Tuberculin will do it as well as any other and the statement that the Dreyer antigen has all the virtues and all the faults of Old Tuberculin applies equally to any of the more recently produced specific vaccines or antigens—provided they have any virtues at all.

In a recent editorial, Webb (*Jr. Lab. and Clin. Med.*, 1923, 9, 129-139) reviews the status of "cures" which are receiving publicity at the present moment and states that:

"Too frequently in the lay press we see announcements of 'cures' for tuberculosis. It is interesting that those prominently paraded in recent years have mostly been variations of 'tuberculins,' first announced by Koch as 'cures' for this disease. We continue to get reports in the German medical literature of the good results obtained by the inoculation of the living attenuated tubercle bacilli obtained from the turtle by Friedmann. This treatment was tried out in the United States in 1912-13, following a visit to this country by Friedmann, and an unprecedented booming by the lay press, and it was definitely determined by competent medical men that this treatment did not cure. For several years, in Europe, the newspapers have been playing up the Spahlinger, 'cure.' A campaign is at present under way in the London newspapers to raise money to assist Spahlinger. The theme again is that of tuberculin, masquerading under the name of antigen, the tubercle bacilli, according to an article in the *Lancet*, having been 'harried' to induce them to give off toxins, before being killed by diffused daylight. In addition Spahlinger claims to have isolated twenty different toxins—no scientific investigator having yet produced one—with which horses are immunized and sera obtained for the treatment of febrile cases. No carefully controlled scientific studies on cases treated with these remedies have yet appeared, although prominent physicians have frequently been referred to as advocates of the method. We find in the literature that Donna employed tuberculin, in which the bacilli had been killed by sunlight, and the Henrys developed a tuberculin in which the cultures had been killed by ultra-violet rays. The results from these tuberculins were disappointing.

"Victims of tuberculosis are now clamoring for the Dreyer tuberculins, which we understand are prepared from tubercle bacilli, from which the wax and fat have been removed. Reports from London hospitals of a few cases treated with this new variety of tuberculin are published. The reports are too new and too few to inspire confidence.

"For several years the Much partial antigens have been having some trial in this country. These variations of tuberculin are in part fat-free, but no extraordinary percentage of cures has, as far as we know, resulted from their use.

"It is claimed for all the products above named that no serious reactions follow their employment, and that should reactions occur, it can be predicted that no harm to the patient will follow.

"Everyone who has employed the Koch tuberculins has been struck by the excellent results obtained in many patients following the production of a reaction. At the same time these same physicians have seen serious illness and death quickly follow the reactions produced by Koch's tuberculins.

"There can be no doubt that many of the excellent results claimed by the originators of these new tuberculins, or antigens, are in patients who are not truly victims of tuberculosis. The difficulty in making a correct diagnosis in patients with pulmonary complaints, in whom tubercle bacilli are not present in the sputum, is well known to all good clinicians.

"Physicians in general will remain thoroughly sceptical of all claims for tuberculosis 'cures,' especially those which are merely variations of the original tuberculins. Tuberculin still holds a place in the treatment of certain forms of tuberculosis, especially in the so-called 'surgical' types. It is a remedy which may be very harmful in some cases of pulmonary tuberculosis. Such variations of tuberculin, as those of Spahlinger, Much and Dreyer, should not be proclaimed as 'cures' to the unfortunate victims of tuberculosis."

As several other workers have already done, Georges Dreyer (*Brit. Med. Jr.*, 1, 1065, 1923) has made a tubercle antigen through the chemical treatment of the bacilli in order to remove their insoluble parts. The acid fastness of the tubercle bacillus is associated with certain lipoidal substances which are entirely resistant to the lytic forces of the tissues. It is conceivable these lipoidal substances protect the specific bacterial proteins preventing their liberation from the body of the bacterium and thus prevent or retard the necessary stimulus for the production of immunity. Working along this line it soon became evident that something more than simple extraction with ordinary fat solvents was necessary to remove the acid-fast lipoidal substance and a clue to the problem was found in the observation that tuberculous tissue when fixed in formalin often shows a far smaller number of tubercle bacilli upon staining than the same tissue after fixation in a mercury solution. Treatment of the bacilli from cultures with formalin showed that they still remained acid fast but became more granular in appearance. But bacteria so treated could easily be rendered non-acid fast by the use of fat solvents. It was already known that formalin-treated tubercle bacilli retained their antigenic power and actual trial demonstrated that this was not lost even by subsequent treatment with acetone.

The exact details used for the preparation of the antigen have been published. This consists essentially in treating the bacilli with formalin and with acetone and then grinding them very much as the whole tubercle bacilli are ground for the preparation of Koch's



bacillen emulsion. In experiments upon rabbits it has been found that the defatted tubercle bacillus antigen thus prepared stimulated the production of complement-fixing antibodies, precipitins, and agglutinins. Guinea-pigs were infected and treated with the antigen after disease had developed. According to the protocols in the experiments of which details are given the disease in the guinea-pigs was arrested while the control animals died. Dreyer says with regard to his work upon animals "that treatment with the 'defatted' antigen brings about a definite improvement both general and local in animals infected with *B. tuberculosis*. Additional evidence for this view is given by the guinea-pig No. 27 which died, for its organs show what seem indubitably to be a healing of tuberculous lesions. Of course, only time can show whether this beneficial effect is permanent. In order to attain certainty on this question, it will be necessary to watch the animals for a long period without further treatment, and then kill them and make a search for tuberculous lesions in their organs." At a London hospital Fildes and Western have under treatment with Dreyer's antigen sixty cases of tuberculosis. Improvement has taken place in nearly all cases and is, in the opinion of these physicians, "of an order which exceeds obviously that obtainable by any other form of treatment which is applicable to these conditions."—*Brit. Jr. Exper. Path.*, Lond., 1923, 4, 146.

In Germany Prof. Paul Uhlenhuth and his co-workers have for several years been studying various ways to immunize experimental animals to tuberculosis. In this research they have used products of tubercle bacilli obtained by an almost infinite variety of procedures. They, like Dreyer, worked out a method for robbing the tubercle bacillus of its waxy and fatty elements. The most effective means for doing this they found to be treatment of the bacilli for two days with chemically pure trichlorethylene. But treatment of guinea-pigs with the residue failed just as signally to immunize these animals against subsequent infection as did treatment with any other product of the tubercle bacillary substances. Whether the various constituents of the tubercle bacillus were injected singly or together the fate of rabbits and guinea-pigs was the same; they fared no better than the control animals when inoculated with virulent tubercle bacilli. Uhlenhuth confesses that he is very pessimistic of the likeli-

hood of immunity to tuberculosis ever being achieved by the administration of dead products of the tubercle bacillus.

Another line of research on which he has been engaged is an attempt to produce an anti-tubercle serum. He has injected cattle with a twenty-one-year-old virulent strain of tubercle bacilli and tested the serum of animals so treated upon guinea-pigs. The result has been quite disappointing. The reaction of these animals to subsequent inoculation with virulent tubercle bacilli has not been appreciably better than that of the control animals.—*Deutsche med. Wchschr.*, Sept. 21, 1923.

*Friedmann Method.*—Korte, Palmié, Kraus and Lubarsch in a final report of a subcommittee to examine the Friedmann tuberculosis remedy (*München. med. Wchschr.*, 1923, 70, 401) state:

(1) The material seems harmless. (2) Opinions on its therapeutic virtues are still conflicting. (3) Cases of tuberculosis suitable for treatment with this remedy are not easy to detect with certainty even by experts. (4) The material, claimed to be most effective in juvenile tuberculosis, has yielded astonishing results even in the hands of opponents of Friedmann, and after but one or two injections. (5) There is no agreement as to the virtue of this material in pulmonary tuberculosis. (6) It is yet too early to decide on the permanency of cures effected and on the value of the material as a prophylactic against tuberculosis. (7) The comparatively few experiments done on small animals with the material are not useful in determining its value in natural tuberculous infection. (8) It is still undecided whether the action of the material is a non-specific one or due to a relation of the turtle tubercle bacillus to genuine *B. tuberculosis* of humans and animals. (9) A large number of reports from veterinary practice has been favorable, but they need to be better controlled. (10) The material has, therefore, not performed what was expected of it at first, and it is no sovereign remedy for tuberculosis. (11) Experiments with cattle could not be undertaken.

*Sun Cure of Surgical Tuberculosis at Leysin.*—Sir Frederick Mott (*Lancet*, December 1, 1923, 1171) describes most interestingly in the following language his visit to Leysin, Switzerland:

Impressed by the reported great success of the sun cure I recently took the opportunity offered to English medical men of visiting Leysin, and I attended a short course of lectures and demonstrations given by Doctor Rollier and his staff of assistants and experts. Doctor Rollier, with whom I had several conversations, told me that he was formerly an assistant of the great Swiss surgeon, Professor Kocher, of Berne, but he was obliged to leave Berne on account of his wife's health, and he had to seek a place where there was no practicing doctor, but where there was plenty of sunshine and pure air. His wife made a perfect recovery and has assisted him in his great pioneer work, which he has the satisfaction of seeing rapidly spreading to all civilized countries. He told me that he had seen the failure of surgical intervention in tuberculosis of the bones, the spine, and joints, and that this had led him to try heliotherapy. He took us to the chalet where he commenced the sun treatment. This small clinic contains about thirty of the poorer class of patient, but there are now a great many clinics for all classes of patients who come from all parts of the world. The one I stayed in, "Miremont," was like a very first-rate hotel, with large sunny rooms, each with a veranda on to which the bed could be wheeled, well-furnished and appointed, and the meals, although simple, were wholesome and appetizing. On the top of the building was the solarium and the patients were taken up in their beds in a lift. Concerts and broadcasting from Paris, kinematograph, and performances by the staff and some of the convalescent patients were given several nights while I was there.

*Lectures and Demonstrations.*—The lectures and clinical demonstrations were given by Doctor Rollier and his assistants. The expert radiologist, Dr. H. J. Schmid, showed a series of skiagrams of normal conditions of the spine, the pelvis, and bones of the limbs, followed by demonstrations of excellent skiagrams and various pathological lesions of these structures, especially of those due to tuberculosis and osteomyelitis. In the course of these demonstrations a number of skiagrams of lesions of these structures before and after treatment were exhibited.

Doctor Rollier pointed out that the whole principle of the treatment of tuberculous disease of bones and joints was to obtain a spontaneous cure. The only surgery performed was the aspiration of pus by puncture with a trocar when an abscess had formed, and this was rarely necessary. He said it was the secondary infections that did the mischief and were so difficult to combat successfully, because the suppuration, if prolonged, caused amyloid disease. In his clinical lectures he showed the mode of treatment and the results obtained both by photographs before treatment, and skiagrams taken at intervals during treatment. The patients were brought into the lecture room on movable beds. He explained and demonstrated the various devices he adopted for the extension of hip, knee, and ankle to prevent deformity while undergoing the sun cure. It was remarkable how well developed the muscles of these patients were, in spite of prolonged immobility, and he attributed this to the action of the sun's rays producing an increased flow of blood to the parts exposed. It is possible, as will be pointed out later, that energy may be absorbed by the blood and distributed over the whole body, and it is not improbable that by the stimulating action of the light the reflex tonic contraction of the muscles and their nutrition are increased.

At the clinics which I visited I saw cases of Pott's disease kept lying on



their faces, and by means of supporting bags, filled first with millet seed and later with sand, spinal curvature was gradually reduced during exposure to the sun's rays. The products of inflammation are thereby absorbed, granulation tissue is formed, and calcification with fixation takes place. Many cases were shown, and X-ray pictures before and after treatment exhibited. Two young girls with hip disease who had recovered, with admirable movement and able to bend hip and knee and ankle, were shown to us, and it would have been difficult from their walk to know that there had been grave disease. Doctor Rollier said he had never had a case of tuberculous ankle or wrist in which free movement had not followed treatment. Particularly interesting were some skiagrams of a case of tuberculous knee-joint before and after treatment. These skiagrams clearly demonstrated that not only were all the inflammatory products absorbed, but that new cartilages had been formed having a normal appearance. This seemed difficult to explain, and I would suggest that just as in regeneration of a nerve after section the new outgrowing fibres from the central end find their proper termination in the skin and muscle as if by an innate association cell-memory, so the undestroyed cartilage cells proliferate, and by an innate memory so dispose themselves under the stimulation of the dynamic forces of pressure, exercised in gait and station as to take on their original functions in the joint. Every stage of spondylitis and arthritis was shown in young and old and all were doing well and making for recovery. At the *châlet*, where Doctor Rollier first commenced the sun cure treatment, I saw an English woman with tuberculous arthritis of the right shoulder with secondary microbial infection and suppuration. There were two fistulæ, besides which there was tuberculosis of both apices of the lungs. When she came to Leysin she had a swinging pyrexia and her photographs denoted misery and cachexia. Three months had elapsed, the temperature was normal, she looked, felt, and spoke as if she were a happy woman and hopeful of recovery. She had put on 9 kg. in weight, and under the healing and bactericidal influences of the sun and general improvement in health the fistulæ had healed up. Another remarkable case was one of Pott's disease in a child who came with abscess formation, prolonged suppuration, and albuminoid disease of liver and kidneys; this was treated in the usual way, but milk was the only nourishment for one year. The urine no longer contained albumin and the liver was no longer enlarged.

I saw a child that was freckled in the face and Doctor Rollier remarked that this patient would require very careful handling, as people with freckles did not pigment readily; likewise, the great difference between the skins of dark and blonde subjects must be borne in mind, as the latter are much more sensitive to sunlight and require extremely careful treatment if over-exposure is to be avoided. The experimental researches of Dr. P. Bloch point strongly to the fact that the formation of pigment must be sought in an enzyme which he shows exists in the basal cells of the epidermis. It cannot be demonstrated experimentally in the skin of an albino animal. This ferment is activated by all agents which normally produce pigmentation, the action of light being particularly striking. It is called *dopa-oxydase*. It may be inferred that the Mediterranean type of human beings would have relatively much more of this ferment in the cells of the *rete Malpighii* (where pigment is normally deposited) than the Nordic type. It is not inconceivable that the freckling of the skin may point to an admixture of unblended Mediterranean and Nordic types of skin in which



the latter is, for the most part of the body surface, dominant. The vulnerable parts of the skin to the invasion of microorganisms are the sebaceous glands and hair follicles. Acne, boils, and carbuncles are caused by infections of these structures. Sun treatment by its bactericidal action prevents the occurrence of these affections. I did not see acne in any of the patients, nor did I see it in any of the boys and girls at the *École du Soleil*.

I will now briefly allude to some of the general principles of technic which I saw. The method consists in beginning always with the feet and isolating both legs and arms before exposing the abdomen and thorax. By this means a general idea of the tolerance of the patient to sunlight is attained before the more vulnerable parts of the body are exposed. Short periods of exposure alternating with periods of rest (*e.g.*, 10 to 15 minutes) make the body tolerate a much greater total amount of sunlight than would be possible with one long sun-bath, which is more fatiguing to the patient and more irritating to the skin. A series of moderate reactions three or four times a day for fifteen minutes causes more rapid acclimatization than is the case with a single bath of thirty minutes. When once, by this graduated system of exposure, the patient is pigmented all over there is no longer any danger and the patient may then have several hours of sun-bath every day.

*Local Reactions.*—One effect of the sun-bath is analgesia and this is most marked in lesions of the joints and abdominal cavity. Another phenomenon of local reaction, if the lesions be at all active, is that the affected part becomes tense and uncomfortable; the treatment should then be discontinued or an acutely painful reaction will occur. When a tuberculous joint or glands are exposed there is a swelling of the part affected and a similar phenomenon, though less easily demonstrable, occurs in the region of a deep-seated abscess. In the region of the lesion sensible perspiration occurs, while the parts around remain dry. A rise of temperature in the neighborhood of the lesion is a constant occurrence. In a patient who is already pigmented there is a difference of color in the neighborhood of the lesion unless there is a sinus or operation wound, then a much darker pigmentation appears in the affected region. Doctor Rollier laid great stress on free drainage. Where there is suppuration gauze was used as a dressing. Sinuses heal up and bone sequestra come away under the influence of the sun treatment.

Those who are interested in the theory and practice of this important development of the *vis medicatrix naturæ* should study "Heliotherapy." Dr. A. Rosselet, who contributes a valuable chapter on the scientific basis of heliotherapy, comes to the following conclusion:

"In heliotherapy, success must not be attributed solely to the action of light, as the quality of the air breathed, and of the nutrition absorbed, with rest, are also factors of great importance. On the other hand, it would be a mistake to look upon light as merely an adjunct to those other factors determining cure." Doctor Rosselet suggests that light may be absorbed by the blood, and "the energy given out by the radiations be stored and carried in the blood-stream to every part of the body; when liberated it stimulates the intracellular processes of oxidation and reduction."

Sir William Bayliss does not apparently accept this as a proven theory. No doubt there is an unusual metabolism of the body which fully accounts for the well-developed musculature in spite of the immobility, but the stimulus of

sunlight on the sensory nerve endings in the skin would tend to induce a uniform continuous reflex tonus in the muscle.

*Atmosphere of Cure.*—The general sense of well-being noticed in the patients may also be due to the "atmosphere of cure," inducing faith, hope, and patience to bear their lot. The *bien-être* thus induced plays a very important part in the recovery by promoting digestion, assimilation, and nutrition, also natural sleep. These necessary conditions for the storage of mental and bodily energy and for improving the natural defences of the body may be seriously interfered with by impatience, discontent, and anxiety which, by staying the flow of the appetite juices, interfere with digestion, assimilation, and nutrition. Again, insomnia and unrefreshing sleep—disturbed by dreams—occur where faith and hope are absent. Depressing drugs have to be administered to produce sleep and rest, and as a consequence there is a lowering of the store of vital energy. If the sun treatment is so successful in the cure of tuberculosis why, it may be asked, should it not be adopted for the prevention? Why not treat sick patients on open verandas in the country where pure air and sunlight can be found? Why should chronic cases be kept in large expensively constructed buildings in our large towns and cities, when they can be so easily and comfortably transported to salubrious spots in the country? These are questions to which the Ministry of Health might well give attention. Before the war I visited some of the schools in Birmingham with Mrs. Pinsent and saw an open-air school for tuberculous children; I remarked then that the children looked healthier than the children in the normal schools. Would it not be better to have all schools so constructed as to obtain the greatest amount of sunshine and fresh air? Not until we can get rid of slums and back-to-back houses in our towns and cities, where the sunlight cannot enter, and house our poor people in proper dwellings will the reproach of rickets as an English disease be undeserved.

The establishment of an "atmosphere of cure" in sanatoriums largely depends upon the brain directing and presiding over the organization and administration. Sense of discipline, morale, and self-respect form essentials for success. The value of occupation and amusement in establishing a sense of *bien-être* during convalescence cannot be over-estimated as a means of strengthening the natural defences. My experience during the war showed me how important it was to get the neurasthenic or hysteric soldier to take up some outdoor occupation in which he had an interest. This one could do by not following the usual stereotyped army methods, but by telling the soldier whatever he grew in the garden he could have, or whatever he made in the workshop would be his own property to do what he liked with. The men asked to come and do work, and were not told to come. Again, I am a great believer in the value of music, especially choral singing, as a means of producing a *joie de vivre*.

#### TULARÆMIA

Rabbit fever, the "all-American disease," so ably discussed by its discoverer, Dr. Edward Francis, in volume two of the thirty-third series of the INTERNATIONAL CLINICS, has caused at least two deaths in America. In Utah, Wyoming, Idaho and Colorado human cases have been well known for the past fifteen years, and the disease

is widely distributed over this continent. It is probably the most contagious of all diseases now studied in the laboratory, Doctor Francis and his co-workers and those studying the cultures at the Lister Institute of Experimental Medicine in London all paying the penalty for their scientific zeal by being attacked with tularæmia. Many physicians have no doubt had patients suffering from this affection without knowing it, and all persons who are seen with an ill-defined fever, and who have recently handled rabbits, should be studied carefully in the light of our present knowledge of rabbit fever.

**TYPHOID FEVER** See also **VACCINES**

*Typhoid Carriers.*—Efforts have been made recently by Beckwith (*Jr. Infect. Dis.*, 1923, 33, 457) to learn whether or not the typhoid carrier state might be influenced through some chemotherapeutic agent. Rabbits were experimentally made carriers, and then treated with a number of different compounds, among which were included arsphenamin, neoarsphenamin, iodine and acid dyestuffs. None of these was found effective. This is quite in line with similar efforts made through the injection of typhoid vaccines. The only procedure likely to have any lasting influence upon the carrier state in enteric fever is apparently eradication of the gall-bladder by operation.

**VACCINES** See also **RÖNTGEN-RAYS**

*Bacterial Vaccination by the Mouth.*—During the past two or three years keen interest has been aroused in a method of vaccination largely the result of work done in the Pasteur Institute by Besredka, following more or less closely the ideas of Metschnikoff. This work is based upon the thesis that the only solid immunity is that residing in the tissues directly concerned with the primary invasion or seat of localization of the infection. For instance, observations upon anthrax seem to indicate that if the epithelium is immunized, the animal treated is far more refractory to the disease than if the vaccine be given subcutaneously or intravenously; in other words, the best method of immunization would seem to be that leading to local immunity.

The greatest interest possibly has centred about the demonstration by Besredka that animals may be immunized to the typhoid and

paratyphoid bacilli through the administration of vaccines by the mouth. It is obvious that if effective resistance to typhoid fever could be obtained through the oral administration of vaccines, the process of immunization consisting merely of swallowing a few pills, many of the objections to typhoid vaccine as given at the present time would be removed. Enthusiasm for this method has apparently reached such a pitch that Prof. A. Calmette (*Ann. de l'Inst. Pasteur*, Par., 1923, 37, 900) believes that the merits or demerits of the method demand careful examination. Analysis of the work done upon the absorption of bacteria from the digestive tract, the mechanism by which the invading bacteria are destroyed and eliminated, and study of experiments made with groups of human subjects show that oral vaccination cannot yet be safely adopted to prevent typhoid, paratyphoid, bacillary dysentery, cholera, tuberculosis and other infections. It should not be adopted until a method has conclusively proved effective and its results carefully compared with subcutaneous vaccination. Subcutaneous vaccination has demonstrated its effectiveness, and with the exception of dysentery has proved to be dependable. On the other hand, oral vaccination would be so much more acceptable than the subcutaneous route that since experiments in oral vaccination are more or less promising, studies upon it should be vigorously prosecuted. It must be remembered that in seemingly successful tests made in animals very large numbers of bacteria must be given by mouth repeatedly, no success having been obtained with a single dose. The quantity required to protect such animals is close to the toxic dose. Finally, experimental results must be prudently awaited.

#### VITAMINS

*Sterility Caused by a Dietary Factor.*—Evans and Bishop (*Jr. Metabolic Research*, 1923, 3, 201, 233) describe a vitamin or dietary factor which would seem to be essential for reproduction. Female rats were fed on a basic ration which permitted them to develop with every appearance of health and show normal growth, but during the taking of which practically all such animals were sterile. That this condition of sterility was the result of a dietary condition was demonstrated through a change in the dietary in which the essential factor



was supplied. The sterility produced by the properly controlled dietary does not interfere with the earlier stages in gestation. There is apparently normal estrum and ovulation and the fertilization and implantation of the developed ova appear to be normal but invariably there is disease and resorption of the products of conception. The sterility may either be prevented or cured by addition to the basic ration of lettuce, meat, whole wheat, wheat germ, rolled oats, dried alfalfa and large quantities of milk fat. Whole milk fresh or dried, cod-liver oil, orange juice and yeast failed to act as curative agents when added to the diet. The salt content of the basic ration was properly controlled.

*A Preparation of Vitamin A from Cod-liver Oil for Subcutaneous Injection.*—E. Poulsson, Professor of Pharmacology in the University of Christiania, has extracted from cod-liver oil a preparation in olive oil of vitamin A containing a hundred times more of this important substance than does ordinary oil expressed from the livers of the cod. The dose to be administered is 1 c.c. every other day.—*Brit. Med. Jr.*, Jan. 19, 1924.

*Value of Watercress.*—The eating of watercress, given under proper hygienic conditions, should be an appreciable help in remedying dietary errors caused by urbanization.

#### WHAT PEOPLE THINK OF THE DOCTORS

The *Illinois Medical Journal* has done good service during the past year in tabulating into twenty-two groups the replies received from nearly seven thousand persons as to what their personal opinion is of the members of the so-called regular profession. Here are a few of the groups, with remarks thereon:

There is a large group of people who will tell you that the physician is negative. He tells you what you must *not* do, warns you of ensuing fatalities; the osteopath, chiropractor, does something concrete for you. The mental reaction is better.

There are others who will tell you that the physician has too good a graft. He looks at you once and charges you five dollars for a prescription which he gets from a book on the shelf. You can do quite as well by going to the corner drug-store.

There are those who say that doctors resent questions. They either shut you up summarily or overwhelm you by an utterly incomprehensible explanation.

It is said that doctors habitually criticize treatments and healing methods of which they know nothing. How many doctors have questioned carefully a

patient who has been helped by chiropractic treatment? How many of them have even seen a treatment? Yet they criticize it, regardless.

Others say that physicians are not consistent in their ethical practices. The man who goes after business by the business method of advertising is likely to be thrown out of his society. Yet the doctor with a spectacular patient, and with enough of a graft with a city editor to exploit him, becomes a high-priced specialist, and everybody is anxious to call him into consultation.

There are people who misunderstand your ethical ideals. They say that an honest man will protect a crook. That if another doctor has blundered disastrously on a case, you will do absolutely nothing to prevent his repeating the performance on any patient who may stray into the office.

There are those who believe that successful doctors use for their patients parts of the very same treatments that make the irregular practitioners successful—diet, massage, adjustment, and let nature do the work—but they drag it out longer, clutter it up with useless medicine, make it cost more, and don't tell you the truth about it.

Another group says that doctors are always a bar to progress because they fight social legislation, such as the Sheppard-Towner bill, and the only news stories to be found in the public press show their motive to be a selfish financial one.

The cults—and this comment was made of many—draw upon forces that are greater than man. The doctors' resources are human and mechanical!

Another group wondered if anyone interested in healing methods hadn't better read the exposé of the medical profession recently appearing in a popular magazine. It showed how little most doctors knew about the drugs they prescribed.

Another group said that since doctors seem to be responsible for the vast group of drug addicts so much discussed now, it is dangerous to let yourself be given drugs for any kind of illness, and drugless healers are, therefore, best.

Others say that there are too many specialists. It is too expensive to be handed around from one to the other for each separate thing they think might be the matter with you. It is better to go to someone who can take care of everything at once.

And there is the group that says that there is no way of telling which is the good doctor and which is the bad one, and it is too dangerous to experiment with them. Osteopathy—or each man's favorite practice—can't hurt you, and has cured every difficulty so far.

It doesn't make any difference how wrong the people are or how much they are at fault in not knowing that they are wrong. It is a fact that almost seven thousand people honestly believe these things and that these seven thousand people are not confined to ditch-diggers or dish-washers or common laborers. Every one of them is likely to call you frantically at 2 o'clock in the morning if there is something considered a real emergency.

Medicine is the one profession in the world where a man takes an independent attitude with a humanitarian point of view. It is the one profession in the world where you have constantly cut down your own income by constantly striving for preventive medicine.

Here is one of your biggest jobs. Whatever plan you have designed for your committee on educational propaganda, I think the dense ignorance of almost seven thousand people would be worth while putting the general public straight

on. Now, to most of you, educational propaganda means a distorted form of advertising. But there is no advertising on earth of the display type merely that is going to work a reform in people's minds. They will discount it as mere propaganda. It would be hard to make it readable. It would be hard to make it say anything and stand out apart from the much-disliked practices who started out in the display game. There are other more effective ways of reaching people humanly—of going ahead along the line of telling the truth about medicine.

If the things are true about you men that your leaders say are true, the story of medicine has enough punch in it to make one of the best, one of the most interesting stories ever told in America. And it seems to me that professional men can no longer afford, either practically or for the sake of their patients, to have people ignorant. It means 93 per cent. of these people do not care to come to you unless they think they are going to die. It means that they are actively interested in other things. The modern mind is a little bit over-stimulated.

If I were a business man and had invested a large sum of money, together with seven or eight years of my life, in preparing myself to do the sort of service you are able to do, and if the quality of my service was from year to year increasing, and if the potential customers for that service from year to year, country wide, was decreasing in proportion to the wealth of the country and the population of the country, then I think I would do something and I think I would do that quickly.

#### WHAT ONE SHOULD KNOW

*Bacillus coli* is designated by a committee of the Society of American Bacteriologists *Escherichia coli*, and *Bacillus typhosus*, *Eberthella typhi*. So the reader had best be prepared to meet these old friends and enemies under their new names in medical literature.

#### X-RAYS

*Radiography of the Fœtus*.—At the meeting of the Obstetric and Gynæcological Section of the Royal Society of Medicine held on December 6, 1923, T. I. Candy read a paper of very great interest on radiography of the fœtus *in utero*. He referred to various technical difficulties and explained how these had been overcome. He was now able to obtain a satisfactory picture after an exposure of not more than five seconds. It was difficult to believe that so short an exposure could possibly harm the mother or fœtus. In certain cases pregnancy had been demonstrated at a very early stage. Positive evidence was naturally irrefutable, and he was even inclined to regard negative evidence as definite in cases of supposed pregnancy of six months' duration or more. Pneumoperitoneum had been practised in certain clinics abroad as a means of facilitating X-ray demonstrations, but he regarded this procedure as unjustifiable. The

advantages of radiography were obvious. It had hitherto been used most frequently perhaps to diagnose multiple pregnancy; it was of further value in demonstrating the position and lie of the foetus, the date of pregnancy, and the relative sizes of the foetal head and maternal pelvis in cases of doubt. It had been interesting to observe instances of rapid change of position of the foetus *in utero*; also to note the marked separation at the sacro-iliac joints quite early in pregnancy.

At the same meeting, Geoffrey Fildes exhibited reproductions of illustrative radiographs. In one case he had been able to detect the existence of twins *in utero* eleven weeks after the last menstrual period. He had attempted to localize the placenta, but was not as yet satisfied with his results; although, in a case of placenta prævia, the evidence appeared to be sufficiently definite.—*Brit. Med. Jr.*, Dec. 14, 1923.

In the *l'affaire d'Evreux* which excited so much interest in France, there was a large judgment for the plaintiff against a French surgeon because he diagnosed a fibromyoma without an X-ray examination and found a viable infant at the operation.

Sir Humphrey Rolleston, M.D., president of the Royal College of Physicians of London, gave such an excellent talk on the present status of radioscopy and radiotherapy at the opening ceremony of the Samuel Miller X-ray wing of the Weymouth and District Hospital on November 3, 1923, that we give the account in the *Lancet*, November 10, 1923, almost in full:

Röntgen died at München on February 10th last in his seventy-eighth year, and thus had the satisfaction of seeing the enormous advances that his observation has rendered possible, not only in pure science but in its practical application, especially in the art of healing. Those who were in practice before radiology became the hand-maiden of medicine and surgery know what a revolution has taken place in our means of accurately detecting disease. This is shown, perhaps as well as any detailed review would do, by the fact that an action for professional negligence has been brought against a medical man on the ground that he did not employ X-rays in a case of possible fracture of a bone. Unlike many great advances in medicine, notably Lister's antiseptic method, the use of X-rays was at once taken up most enthusiastically and, though its professional applications took some years to develop, on account of many technical difficulties, it was never neglected or opposed. In fact, within a week of the announcement of the discovery, Cox, in far-off Montreal, localized a bullet which for seven years had caused trouble in a patient's leg and so led to its extraction on the following day. First employed for the detection of fractures, foreign



bodies, and calculi, X-rays were in the same year (1896) applied by J. Macintyre, of Glasgow, to the diagnosis of intrathoracic disease, such as aneurysm; about ten years later pyelography came into vogue. That advances are constantly being made may be shown by a few examples; the introduction of gas into the abdominal, cranial, or even other cavities before an X-ray picture is taken is now employed to define more clearly the position of a tumor, and Dr. R. W. A. Salmond (*Proc. Roy. Soc. Med.*, 1923, 16, 71) has shown how valuable the introduction of air into the pericardium—a previously unexploited region by this method—may possibly be in the detection of unusual and otherwise unrecognizable lesions; Professor Jacobaeus's thoracoscopy with division of pleuritic adhesions under the X-rays opens new possibilities in connection with the treatment of pulmonary tuberculosis by artificial pneumothorax; Sicard's method of localizing the level and extent of spinal fractures, adhesions, or tumors obstructing the intrathecal space by means of injection of lipiodol (a non-toxic solution of iodine in poppy-seed oil) before the spine is X-rayed, now employed by him in 150 cases (Sicard, Parof and Laplane, *Presse Méd.*, 1923, 36, 885), is a most promising aid to diagnosis; Mr. P. Sargent was the first to report its use in this country; and Sicard's pupils, Jacques Forrestier and L. Leroux, have applied it to the detection of pulmonary lesions such as bronchiectasis. The demonstration of gall-stones has been followed by that of other pathological changes in the gall-bladder; and the discovery, by Prof. Gösta Forsell, of Stockholm, that the mucous membrane of the gastro-intestinal tract undergoes active movements, apart from the coarser contractions of the muscular coat, and thereby controls the distribution and regulation of the contents, has physiological and pathological bearings as yet not recognized. As regards diagnosis, X-rays have provided an additional sense or new eye, and their extension of the field of vision is comparable with the advancement made when microscopic lenses and telescopes were first introduced. In the twenty-eight years since X-rays were discovered the mental attitude of clinical workers has gradually undergone a change, the magnitude of which is only realized when a medical man finds himself in some place where X-rays are not available for help in a case of doubtful diagnosis.

X-rays are not so widely employed or so well established in treatment as in diagnosis and, as has already been pointed out, it is mainly in regard to the latter that they have changed our outlook on medicine. In some skin diseases and superficial tumors their beneficial influence has been proved beyond question, and the autolytic effect of irradiations has been utilized in uterine fibromyomas, prostatic hypertrophy, erythremia, exophthalmic goitre, metrorrhagia, lymphadenomatous and other enlargements of glands, an chronic tonsillitis, and good results in other affections may confidently be anticipated. But remedies powerful for good are not without risk when employed in large doses, and the dangers attaching to X-rays are now fully recognized. Those most constantly in contact with irradiations are naturally most prone to suffer, and many pioneers of radiology, before the risks were fully realized, paid dearly for their devotion. It has been estimated that a hundred radiologists have died from X-ray carcinoma of the skin; and that aplastic anæmia, chronic ill-health, and sterility may be produced in radiologists is too well known. It is therefore important that the recommendations of the X-ray and Radium Protection Committee should be acted upon, and that all new X-ray departments should be inspected from this point of view by the National Physical Laboratory, Teddington.

The chronic ill-effects of X-rays and radium are naturally almost only seen in X-ray workers, but after long exposures, especially the intensive exposures for hours originating from Erlangen for carcinoma, patients may be extremely ill with acute constitutional symptoms and even die; this is, fortunately, a rare accident, and as our knowledge increases precautions will render it even more so. This form of treatment is still on its trial, and should be exhaustively tested at large X-ray departments under the supervision of whole-time radiologists before its adoption is accepted as a routine therapeutic method of all hospitals. In some cases rapid spread of malignant disease supervenes after radiation and thus recalls the increase in lymphadenoma sometimes noticed after surgical removal of some of the affected glands. This may be independent of radiation or operative interference, but the question whether radiation, especially in small doses short of lethal action, stimulates the growth of cancer cells has been much discussed. In a review of this complex pathological question Ewing (Mütter Lectures, *Trans. Coll. Phys. of Phila.*, 1922, 3d Series, 44, 203) concludes that the danger of stimulating the growth of tumors by the present methods of radiotherapy is extremely remote, and that the view that inadequate radiotherapy can endow the cells with increased vitality is quite unreasonable.

Twenty to forty cubic centimetres of lipiodol—a solution of 0.54 gram of iodine in 1 c.c. of poppy oil—introduced into the bronchi have yielded remarkable X-ray pictures of the lungs, permitting an earlier diagnosis of cavity and tumor formations in this region than by any other known means.

# CUMULATIVE INDEX

## (THIRTY-FOURTH SERIES—1924)

(The Roman numerals refer to volumes; i, for volume I.)

### A

Abdominal wound, closure of, by Keene suture, i, 76  
 Abdominoscopy, i, 234  
 Abortions in United States, i, 43  
 Acne, treatment of, by X-rays and vaccines, i, 278  
 Acridavine in treatment of gonorrhœa, i, 258  
 Adalin in Graves's disease, i, 16  
 Adenoma of thyroid, i, 5, 11  
*Affaire d' Evreux*, i, 300  
 Alcohol injections in neuralgia, dangers of, i, 269  
 Alcoholism, tests for, i, 253  
 American Institute of Medicine, i, 228  
 Anæmia, pernicious, germanium of no value in, i, 273  
 Anal fistulæ, treatment of, i, 138  
 Angina pectoris, surgical treatment of, i, 261  
 Animals, bites of, i, 236  
 Anorectal fistulæ, treatment of, i, 138  
 Anthelmintic properties of carbon tetrachloride, i, 241  
 Antigen, Dreyer's, for tuberculosis, i, 288  
 Argyrol in treatment of eyes of new-born, i, 55  
 Arsenic in Graves's disease, i, 16  
 Ascarides, carbon tetrachloride for, i, 242  
 Ascites, chronic, treatment of, i, 88  
 Asphyxia in newly born, i, 48  
 Atmosphere of cure, i, 294  
 Atom, dynamic, i, 228  
     static, i, 228  
 Atropine in seasickness, i, 281  
 Auricular fibrillation treated by quinidin, i, 262  
 Australian X disease, i, 256  
 Automobile driving while drunk, tests for, i, 253

### B

*Bacillus botulinus* not killed by boiling, i, 275  
*Bacillus coli*, now called *Escherichia coli*, i, 299

*Bacillus typhosus*, now called *Eberthella typhi*, i, 299  
*Bacterium pneumosintes*, i, 257  
 Barker, Lewellys F.: Exophthalmic goitre, i, 1  
 Basal metabolism, i, 235  
     in Graves's disease, i, 8  
 Bath in new-born, i, 56  
 Bayer 205 in trypanosomiasis, i, 286  
 Benign growths of uterus treated by surgery and irradiation, i, 74  
 Bile, changes in, after it gets into the gall-bladder, i, 225  
 Bilirubinæmia, i, 266  
 Birth control, i, 236  
 Bites of animals, i, 236  
 Black-coated poor, i, 233  
 Bladder, tumor of, treated by radium, i, 2  
 Blood, calcium content of, i, 237  
     clotting time of, i, 236  
     mineral constituents of, i, 237  
 Blood-platelets in essential hemorrhagic purpura, i, 39  
 Blood-sugar standards in normal and diabetic persons, i, 247  
 Breast milk, i, 57  
     toilet of, i, 58  
 Brill, Nathan E.: Essential hemorrhagic purpura, i, 32  
 British Workmen's Compensation Act of 1923, i, 232  
 Bromides in Graves's disease, i, 16

### C

Caffeine content of coffee, i, 4  
 Calcium and parathyroid treatment of sprue, i, 285  
     content of blood, i, 273  
 Cancer, etiology of, i, 229  
     heredity in, i, 237  
     of cervix, treatment of, i, 83  
     of spleen, i, 113  
 Capitation fee, i, 229  
 Carbon tetrachloride, as an anthelmintic, i, 241  
 Cardiotomy for mitral stenosis, i, 261

- Cataphoresis in treatment of gonorrhœa, i, 259
- Cattell, Henry W.: Progress of medicine for 1923, i, 227
- Cerebral diplegia, i, 26  
paralysis, infantile, i, 17, 26
- Cervix, cancer of, treatment, i, 83
- Cestodes, examination of fæces for, i, 152
- Characteristics, acquired, inheritance of, i, 262
- Chaulmoogra oil in leprosy, i, 265
- Children, heart disease in, i, 17
- Cigarettes, no-nicotine, i, 3
- Cigars, no-nicotine, i, 3
- Cirrhoses of liver, i, 88  
alcoholic, i, 88
- Cisterna magna, puncture of, i, 244
- Clark John G.: Surgical and irradiation treatment of benign and malignant growths of the uterus, i, 74
- Clinical lectures, department of, i, 1
- Clotting time of blood, i, 236
- Coagulation tests, errors in, i, 66
- Cod-liver oil, vitamin extracted from, for subcutaneous injection, i, 297
- Code of ethics, i, 245
- Coffee, caffeine content of, i, 4
- Cogné René: Use of convalescent serum in a case of congenital measles, i, 99
- College of Physicians, Mütter lecture of 1923 of, i, 187
- Colloidal silver in treatment of gonorrhœa, i, 259
- Colostrum, i, 57
- Compensation laws, workmen's, i, 169
- Congenital measles, convalescent serum in, i, 99
- Contract practice, i, 229
- Control, birth, i, 236
- Convalescent serum in measles, i, 99  
in poliomyelitis, i, 273
- Criminal abortions in United States, i, 44

## D

- Death, sudden, causes of, i, 245
- Department of clinical lectures, i, 1  
of diagnosis and treatment, i, 74  
of industrial medicine, i, 159  
of rectal diseases, i, 138  
of treatment and diagnosis, i, 74
- Dermatitis from sunlight, i, 285  
seborrhœic, i, 71
- Dermatological lesions in new-born, i, 68
- "Devil's gripe," i, 246
- Diabetes, blood-sugar standards in, i, 247  
ketosis, in, i, 249  
odd carbon fats in treatment of, i, 249  
untoward effects from, i, 248
- Diagnosis, department of, i, 74

- Diaphragmatic spasm, epidemic transient, i, 246
- Diet in Graves's disease, i, 15  
in treatment of epilepsy, i, 256
- Diphtheria, Schick for active immunization in, i, 250
- Diplegia, cerebral, i, 26
- Disease, Australian X, i, 256
- Doctors, what people think of the, i, 297
- Dreyer's antigen for tuberculosis, i, 288
- Drueck, Charles J.: Examination of the fæces, i, 145
- Drunkenness, tests for, i, 253
- Dysmenorrhœa from an industrial standpoint, i, 254

## E

- Eberthella typhi*, new name for *Bacillus typhosus*, i, 299
- Eczema, infantile, i, 71
- Education, medical, i, 268
- Ego, subconscious, i, 228
- Eichenlaub, F. J.: Skin affections of the new-born baby, i, 68
- Electrical treatment of gonorrhœa by colloidal silver, i, 259
- Elliott Blanche: Case of herpes zoster in the distribution of the inferior maxillary nerve associated with paralysis of the facial nerve, i, 132
- Encephalitis, epidemic, i, 256  
lethargic, i, 256
- Endocrinology of Graves's disease, i, 12  
medical treatment of, i, 14
- Epidemic encephalitis, i, 256
- Epidemic transient diaphragmatic spasm, i, 246
- Epidermolysis bullosa, i, 68
- Epilepsy, fasting and diet in, i, 256
- Epilopexy, i, 90
- Erb's paralysis, i, 52
- Erysipelas in new-born, i, 69
- Escherichia coli*, new name for *Bacillus coli*, i, 299
- Essential hemorrhagic purpura, i, 32
- Ethics, code of, i, 245
- Exophthalmic goitre, differential diagnosis of, i, 10
- Exophthalmos, i, 2, 5
- Extension courses, medical, i, 1
- Eye injuries, compensation for, i, 174
- Eyes of new-born, treatment of, i, 55

## F

- Facial nerve paralysis, with herpes zoster, i, 132
- Fæces, examination of, i, 145
- Family physician, i, 231
- Fasting in epilepsy, i, 256  
in Graves's disease, i, 15



Fat in Graves's disease, i, 15  
 Fats, odd carbon, in treatment of diabetes, i, 249  
 Fee, capitation, i, 229  
 Fever, inanition, i, 61  
   rabbit, i, 294  
   sand-fly, i, 278  
   scarlet, etiology of, i, 278  
     immunity in, i, 280, 281  
 Fibrillation, auricular, treated by quinidin, i, 262  
 Fingers, tremor of, in Graves's disease, i, 6  
 Fistulæ, anal, anorectal and rectal, treatment of, i, 138  
 Flora, intestinal, i, 157  
 Flumerin in syphilis, i, 257  
 Focal infection in Graves's disease, i, 9  
 Fœtus, harlequin, i, 68  
   radiography of, i, 299  
 Foot-and-mouth disease, i, 258  
 Foote, John A.: General diseases occurring in the newly born, i, 61  
 Fractures in the newly born, i, 52  
 Freckling and sun cure of tuberculosis, i, 292  
 Friedmann's method of treating tuberculosis, i, 290

## G

Gall-bladder, removal of, in treatment of typhoid carriers, i, 295  
 General practitioner, work of, i, 1  
 Germanium, of no value in pernicious anæmia, i, 273  
 Goetsch test, i, 10  
 Goitre, i, 5  
   exophthalmic, differential diagnosis of, i, 10  
 Gonorrhœa, new treatment for, i, 258  
 Gordon, A. H.: Some aspects of migraine, i, 120  
 Graves's disease, surgical treatment of, i, 13  
 Graves's syndrome, i, 1  
 Griffith, J. B. Crozer: Heart disease in children; infantile cerebral paralysis, i, 17  
 Grippe, etiology of, i, 257  
 Group practice, i, 178  
 Growths of uterus, benign and malignant, treated by surgery and irradiation, i, 74  
 Gulstrand's slit-lamp in ophthalmology, i, 270

## H

Hæmal-nodes, i, 260  
 Harlequin fœtus, i, 68  
 Health supervision, industrial, i, 182  
 Heart disease in children, i, 17  
   quinidin in, 277  
   treatment of, i, 261

Heliotherapy in surgical tuberculosis, i, 290  
 Hemorrhage, intracranial, in new-born, i, 63  
   of uterus treated by irradiation, i, 79  
 Hemorrhagic purpura, essential, i, 32  
 Hepatic cirrhosis, i, 88  
 Heredity in cancer, i, 237  
   of acquired characteristics, i, 262  
 Hernia, compensation for, in industrial work, i, 175  
 Herniotomy, living sutures in, i, 263  
 Herpes zoster in distribution of inferior maxillary nerve with facial nerve paralysis, i, 132  
 HI preparation for leprosy, i, 266  
 Hitchens, A. Parker: Progress of medicine for 1923, i, 227  
 Hospitals, voluntary, i, 233  
 Hydrotherapy in Graves's disease, i, 16  
 Hyperbilirubinæmia, i, 266  
 Hypertrichosis, i, 68  
 Hypobilirubinæmia, i, 266  
 Hypoglycæmia in Graves's disease, i, 6  
 Hysterectomy, pan-, i, 77  
   supravaginal, i, 77

## I

Ichthyosis, i, 68  
 Icterus, gravis, i, 89  
 Illumination, industrial, i, 270  
 Impetigo contagiosa, i, 69  
 Inanition fever, i, 61  
*Index Medicus*, i, 228  
 Industrial health supervision, i, 182  
   illumination, i, 270  
   medicine, department of, i, 138  
   dysmenorrhœa and, i, 254  
 Infantile eczema, i, 71  
 Infection, focal, in Graves's disease, i, 9  
 Infectious diseases, effect on nervous diseases, i, 250  
 Influenza, etiology of, i, 257  
 Insulin, danger of interrupting treatment by, i, 264  
 Intertrigo, i, 69  
 Intestinal flora, i, 157  
 Intracranial hemorrhage in new-born, i, 63  
 Iodine in leprosy, i, 266  
 Irradiation treatment of benign and malignant growths of uterus, i, 74  
 Ivy poisoning, treatment of, i, 265

## J

Jaundice of new-born, i, 66  
 Joffroy's sign, i, 4

## K

Keene suture for abdominal wound, i, 76

## L

- Laws, workmen's compensation, i, 159  
 League of Nations, labor office of, i, 270  
 Lectures, clinical, department of, i, 1  
 Leprosy, treatment of, i, 265  
 Lethargic encephalitis, i, 256  
 Leysin treatment of tuberculosis, i, 290  
 Lipiodol in making skiagraphs, i, 301, 302  
 Liver, cirrhosis of, i, 88  
     function, estimating of, by phenolte-  
     trachlorophthalein, i, 266  
 Living sutures in herniotomy, i, 263  
 Lloyd, James Hendrie: Case of herpes zos-  
 ter in the distribution of the inferior  
 maxillary nerve associated with paraly-  
 sis of the facial nerve, i, 132  
 Lumbar drainage, continuous, i, 267  
 Luminal in Graves's disease, i, 16

## M

- Magnac, J. L.: Surgical tuberculosis of the  
 spleen, i, 106  
 Malignant growths of uterus, treated by  
 surgery and irradiation, i, 74  
 Malpractice suits, i, 227  
 Maternity law, Sheppard-Towner, i, 281  
 Maxillary nerve, inferior, herpes zoster of,  
 with facial nerve paralysis, i, 132  
 Measles, congenital, convalescent serum in,  
 i, 99  
     etiology of, i, 267  
 Medical education, i, 268  
     extension courses, i, 1  
     industrial, department of, i, 138  
 Medicine in South America, i, 284  
     progress of, for 1923, i, 227  
 Mendel's law, in cancer, i, 237  
 Menstruation, early, i, 269  
 Merchant Shipping Act of Great Britain,  
 i, 232  
 Mercurial preparation in treatment of im-  
 petigo, i, 70  
 Mercury in syphilis of new-born, i, 73  
 Metabolism, basal, i, 235  
     in Graves's disease, i, 8  
 Mice, cancer in, i, 237  
     heredity in, i, 262  
 Migraine, i, 120  
 Miliaria, i, 69  
 Milk injections in treatment of psoriasis,  
 i, 275  
 "Milk rash," i, 71  
 Mind, subconscious, i, 228  
 Mineral constituents of blood, i, 237  
 Mitral stenosis, cardiectomy and valvu-  
 lotomy for, i, 261  
 Moebius's sign, i, 4

- Morbus maculosus Werloffii, splenectomy  
 in, i, 32  
 Mortality, natal, i, 41  
     neonatal, i, 41  
     prenatal, i, 41  
 Moron, cost of caring for, i, 227  
 Moser, James M.: Care of the new-born  
 child, i, 54  
 Mother's diet of new-born, i, 58  
 Motor driving while intoxicated, i, 253  
 Muscular weakness in Graves's disease, i, 6  
 Mütter lecture of the College of Physicians  
 of Philadelphia, i, 187  
 Myomata, surgical treatment of, i, 74

## N

- Natal mortality, i, 41  
 Nematoda, examination of fæces for, i, 153  
 Neonatal mortality, i, 41  
 Neotrépol in syphilis, i, 286  
 Nervous system, injuries to, in the newly  
 born, i, 51  
     toxic effect of infectious diseases on,  
     i, 250  
 Neuralgia, danger of alcohol injections in,  
 i, 269  
 New-born, accident to, i, 48  
     asphyxia in, i, 48  
     general diseases of, i, 61  
     hemorrhagic tendency in, i, 63  
     injuries to, i, 48  
     jaundice of, i, 66  
     prophylaxis, i, 55  
     pylorospasm in, i, 67  
     resuscitation, i, 54  
     skin affections of, i, 68  
     stools of, i, 153  
     symposium on, i, 41  
     syphilitic eruptions of, i, 72  
 No-nicotine cigars and cigarettes, i, 3  
 Nodes, hæmal, i, 260  
 Nurses, shortage of, i, 269  
     practical, i, 270

## O

- Occult blood, i, 155  
 Occupational disease, workmen's compen-  
 sation laws for, i, 177  
 O'Donnell, William F.: Injuries and acci-  
 dents in the newly born, i, 48  
 Omophobia, i, 76  
 Omentopexy, i, 90  
 Ophthalmology, slit-lamp in, i, 270  
 Osler as an editorial writer, i, 228  
 Osteochondritis, syphilitic, of new-born,  
 i, 73  
 Oxyuris, carbon tetrachloride for, i, 242

## P

- Pan-hysterectomy, indications for and against, i, 77
- Paracentesis abdominis, i, 90
- Paralysis, cerebral, in the new-born, i, 51  
     facial nerve, with herpes zoster  
     in distribution of inferior maxillary  
     nerve, i, 132  
     infantile cerebral, i, 17, 26  
     spinal, i, 51
- Parathyroid and calcium treatment of  
   sprue, i, 285
- Pathology, living, i, 235
- Patient, half-examined, i, 230
- Pawlow's experiment on heredity, i, 262
- Pellagra, i, 271  
     solution of etiology of, near, i, 272
- Pemphigus neonatorum, i, 70
- Pennington, J. Rawson: Treatment of anal,  
   anorectal and rectal fistulæ, i, 138
- Pernicious anæmia, germanium of no value  
   in, i, 273
- Perspiration, excessive, in Graves's disease,  
   i, 6
- Phenolsulphonephthalein kidney function  
   test, i, 266
- Phenoltetrachlorophthalein in estimating  
   liver function, i, 266
- Phlebotomus papatasi, i, 273
- Phosphorus content of blood, i, 237
- Physician, family, i, 231
- Poisoning, ivy, treatment of, i, 265
- Poliomyelitis, convalescent serum in, i, 273
- Postmortems in workmen's compensation  
   laws, i, 159  
   value of, i, 274
- Practical nurses, i, 270
- Practice, contract, i, 229  
   group, i, 178
- Practice vs. Science, i, 227
- Practitioner, general, i, 1
- Prenatal mortality, i, 41
- Prematurity, i, 59
- Price, George M.: Industrial health super-  
   vision, i, 182
- Prickly heat, i, 69
- Progress of medicine for 1923, i, 227
- Pryor's service, i, 228
- Pseudoscience, i, 228
- Psoriasis treated with injections of milk,  
   i, 275
- Psychoses, stomach as focus of infection  
   in functional, i, 276
- Psychotherapy in Graves's disease, i, 16
- Puncture of cisterna magna, i, 244
- Purpura, essential hemorrhagic, i, 32
- Pyloric stenosis and spasm in new-born,  
   i, 67
- Pylorospasm in new-born, i, 67

## Q

- Quarterly Cumulative Index*, i, 228
- Quinidin in treatment of heart affections,  
   i, 262, 277
- Quinine in Graves's disease, i, 16
- Quinquad's test for drunkenness, i, 254

## R

- Rabbit fever, i, 294
- Radium in treatment of benign and malign-  
   ant growths of the uterus, i, 74,  
   80  
     treatment of Graves's disease, i, 15  
     of tumor of bladder, i, 2
- Rash, milk, i, 71
- Rectal fistulæ, treatment of, i, 138
- Rector, Frank L.: Medical aspects of  
   workmen's compensation laws, i, 159
- Resuscitation of new-born, i, 54
- Rollier treatment of tuberculosis, i, 290
- Röntgen, death of, i, 300

## S

- Sand-fly fever, i, 278
- Scarlatina, etiology of, i, 278  
     immunity in, i, 280, 281
- Schick test, i, 250
- Schüssler's remedies, i, 237
- Science vs. Practice, i, 227
- Seasickness, atropine in, i, 281
- Seborrhoeic dermatitis, i, 71
- Serum, convalescent, in congenital measles,  
   i, 99
- Sex, determination of, before birth, i, 281
- Sheppard-Towner maternity law, i, 281
- Sign, Joffroy's, i, 4  
     Moebius's, i, 4  
     von Graefe's, i, 4
- Silver colloid in treatment of gonorrhœa,  
   i, 259  
     nitrate in impetigo, i, 70  
     salts in treatment of eyes of new-  
     born, i, 55
- Skin affections of new-born baby, i, 68  
     congenital manifestations of, i, 68
- Slit-lamp in ophthalmology, i, 270
- Smallpox, laboratory diagnosis of, i, 282
- South American progress of medicine, i, 284
- Spasm, epidemic transient diaphragmatic,  
   i, 246
- Spleen, cancer of, i, 113  
     surgical tuberculosis of, i, 106
- Splenectomy in essential hemorrhagic pur-  
   pura, i, 32
- Sprue, treatment of, i, 285
- Stenosis, mitral, cardiotomy and valvulot-  
   omy for, i, 261
- Still-births in United States, i, 42

Stomach as focus of infection in functional psychoses, i, 276  
 Stools, examination of, i, 153  
 Streptococcal infection in new-born, i, 69  
 Struma, i, 5  
 Subconscious ego, i, 228  
 Sudden death, causes of, i, 245  
 Suits, malpractice, i, 227  
 Sun cure of tuberculosis, i, 290  
 Sunlight, dermatitis from, i, 285  
 Subconscious mind, i, 228  
 Supervision, industrial health, i, 182  
 Supravaginal hysterectomy, i, 77  
 Surgical treatment of tuberculosis of spleen, i, 106  
 Sutures, living, in herniotomy, i, 263  
 Sweet, J. E.: Gall-bladder: its past, present and future, i, 187  
 Sympathetic nerve, operating on, for angina pectoris, i, 261  
 Symposium on the new-born, i, 41  
 Syphilis as a cause of abortions and stillbirths, i, 46  
     treatment of, i, 257  
     trépol and neotrépol in, i, 286  
 Syphilitic eruptions of new-born, i, 72

## T

Tachycardia in Graves's disease, i, 5  
 Test, Goetsch, i, 10  
     Schick, i, 250  
 Thymus in Graves's disease, i, 15  
 Thyroid, adenoma of, i, 5, 11  
 Thyroxin, i, 8  
 Tice loose-leaf system, i, 228  
 Treatment, department of, i, 74  
 Trematoda, examination of fæces for, i, 152  
 Tremor of fingers in Graves's disease, i, 6  
 Trépol in syphilis, i, 286  
 Trypanosomiasis, Bayer 205 in, i, 286  
 Tuberculin in tuberculosis, i, 286  
 Tuberculosis, specific treatment of, i, 286  
     sun cure of, i, 290  
     surgical, of spleen, i, 106  
 Tularemia, i, 294  
 Tumor of bladder treated by radium, i, 2  
 Tumors in mice, i, 237  
     of uterus, benign and malignant, treated by surgical means and by irradiation, i, 74  
 Typhoid carriers, gall-bladder removal in, i, 295

## U

Umbilical cord, treatment of, in new-born, i, 56  
 Umbilicus, erysipelas of, in new-born, i, 69  
 Ureters, tying of, death from, i, 269  
 Uterine hemorrhage of benign origin treated by irradiation, i, 79  
 Uterus, treatment of benign and malignant growths of, by irradiation and surgery, i, 74

## V

Vaccines by mouth, i, 295  
 gonorrhoeal, in treatment of gonorrhoea, i, 259  
     in treatment of acne, i, 278  
 Valvulotomy for mitral stenosis, i, 261  
 Venereal diseases in seamen, i, 232  
 Vermes, examination of fæces for, i, 152  
 Vitamins, i, 296  
 Von Graefe's sign, i, 4

## W

Wassermann reaction in new-born unreliable, i, 73  
 Watercress, value of, i, 297  
 Weber, F. Parkes: Hepatic cirrhosis and the question of the operative treatment of chronic ascites, i, 88  
 Well, medical examination of, i, 229  
 Willson, Prentiss: Problems of prenatal, natal, and neonatal mortality, i, 41  
 Workmen's compensation laws, i, 159  
 Worms, examination of fæces for, i, 152  
 Wound, abdominal, closure of, by Keene suture, i, 76

## X

X disease, Australian, i, 256  
 X-raying of fœtus, i, 299  
 X-rays, deaths from, i, 301  
     diseases from, i, 301  
     in treatment of acne, i, 278  
     in eczema, i, 71  
     value of, i, 230, 300  
 X-ray treatment of Graves's disease, i, 15

## Z

Zuckergussleber, i, 98











